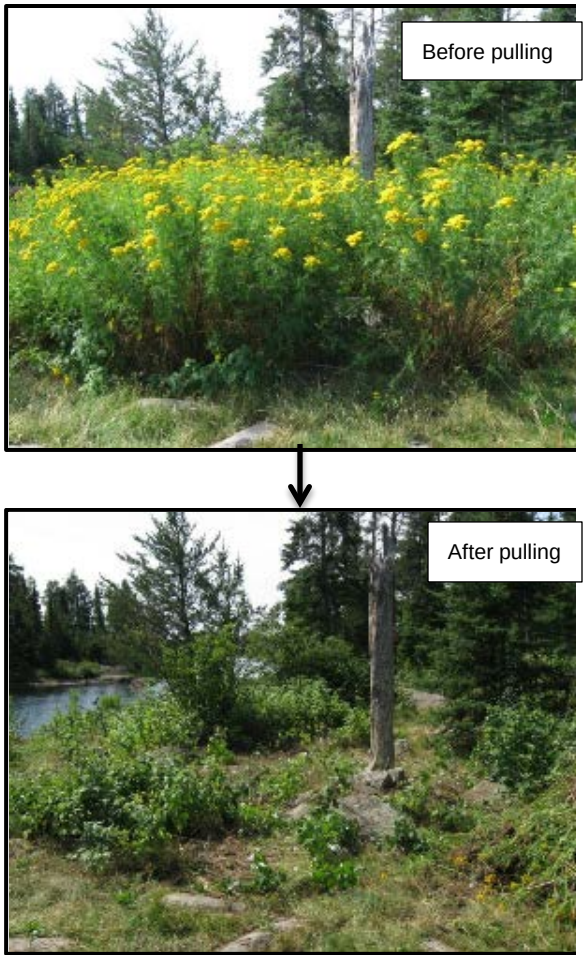
United States
Department of
Agriculture
Forest Service

August 2013

Final Environmental Impact Statement

BWCAW Non-native Invasive Plant Management Project

Superior National Forest
Cook, Lake, and St. Louis Counties, Minnesota



BWCAW Non-native Invasive Plant Management Project
Final Environmental Impact Statement
Cook, Lake, and St. Louis Counties, Minnesota

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Abstract
The Superior National Forest proposes to treat non-native invasive plants (NNIP) in the Boundary Waters Canoe Area Wilderness. The proposed activities would eradicate or contain existing NNIP populations and respond rapidly to new infestations in order to prevent the further spread of NNIP. Management is needed to maintain and improve aquatic and terrestrial wildlife habitat, to maintain healthy, resilient native plant communities, and to maintain the character and ecological integrity of the BWCAW. The Final EIS explains the Project's purpose and need, proposed action, and issues. Under the no action alternative, NNIP management would continue as authorized under a 2006 Decision Notice. Under the proposed action, herbicides and manual methods would be used to contain or eradicate known and future NNIP infestations. Alternative 3, which addresses the issue of herbicide effects to wilderness character, would use manual methods only to treat NNIP. The affected environment and direct, indirect and cumulative impacts of the alternatives are described in detail.

SUMMARY

The Superior National Forest has a unique opportunity to prevent widespread natural resource impacts caused by non-native invasive plants (NNIP) in the Boundary Waters Canoe Area Wilderness (BWCAW).

Purpose and Need for Action

We are approaching a "tipping point" but still have an opportunity to minimize the introduction and spread of NNIP in the BWCAW. Compared to many other wilderness areas, the occurrence of NNIP in the BWCAW is relatively low. Most NNIP species are found on campsites and portages, yet they are surrounded by thousands of acres of susceptible habitat such as rock outcrops and wetlands, and thus threaten native plant communities and wilderness character. Unfortunately, most of the NNIP in the BWCAW cannot be killed by hand pulling. So there is a high-risk habitat and an ineffective control method, and these combine to create a threat to the ecological integrity of the BWCAW.

In order to maintain and improve aquatic and terrestrial wildlife habitat, to maintain healthy, resilient native plant communities, and to maintain the character and ecological integrity of the BWCAW, there is a need to implement an integrated pest management approach that eradicates or contains existing NNIP infestations and provides for a rapid response to new infestations. We propose to implement NNIP management activities, including manual and herbicide control methods, over a ten-year period in the BWCAW.

Proposed Action

The Forest Service proposes to manage NNIP populations using an integrated combination of control methods based on the species and site. These control methods would include hand pump or sponge herbicide application and manual control methods. Herbicide application would be used on NNIP species with spreading root systems, and manual control methods would be used on species with tap roots.

The Forest Service proposes to treat approximately 14.3 acres of known infestations and up to approximately 40-60 acres of new infestations which may spread in the project area in the next ten years. The selective herbicides aminopyralid, imazapic, triclopyr, and metsulfuron methyl would be spot applied to eleven different NNIP species. These proposed herbicides were chosen because they are effective and only kill broad-leaved species, because they have low toxicity, and because they have low use rates. Crews would carry only small amounts of herbicide during work trips, and herbicide would be transported inside two watertight containers. Follow-up treatments may be necessary.

The proposed action is the agency preferred alternative.

Decisions to be Made

Authority for this decision has been delegated by the Eastern Region Regional Forester to the Forest Supervisor for the Superior National Forest. Decisions to be made include:

- What actions will be approved to address the purpose and need
- Where will those actions take place

- Are any mitigation measures needed to further limit effects of approved actions
- Any monitoring of approved actions

A decision is expected in summer 2013 with implementation expected to begin in fall 2013. Treatments would continue under this decision for up to ten years, and actions beyond ten years would require subsequent analysis and decision. If no action is selected, the proposed activities would not occur under this analysis.

Scoping

The Notice of Intent was published in the Federal Register on April 21, 2011. On April 18, 2011 the scoping package was mailed to about 400 individuals, landowners, Tribal governments, and agencies considered to have potential interest in the BWCAW NNIP Management Project. The Superior National Forest received 14 comments on the proposal. Some commenters expressed concern over the effects of herbicide on wilderness character, water resources, human health, wildlife, and native plants. Some commenters wanted to see biological controls considered, while others wanted the effects of activities adjacent to the BWCAW considered. Others wanted clarification of different aspects of the project like prevention, herbicide use, effects to native plant communities, and non-native invasive animals. Several commenters highlighted the natural resource benefits of the project and the project's defined, limited scope.

Issues and Alternatives

The Superior National Forest identified the effects of herbicide on wilderness character as the sole issue that drove the formation of the alternatives. The other issues, concerns, and suggestions were considered in the analysis and addressed as necessary in the EIS, specialist reports or project file.

The issue of the effect of herbicide on wilderness character led the agency to develop Alternative 3. Alternative 3 responds to the public concern about herbicide impacts to wilderness character by limiting NNIP treatments to manual control methods only. Alternative 3 proposes to use only manual NNIP treatment methods to treat the approximately 14.3 acres of existing NNIP in the project area as well as up to approximately 600-650 acres of future NNIP infestations.

In this project the No Action alternative is the continuation of pre-existing management direction provided by the 2006 Superior National Forest Non-native Invasive Plant Management Environmental Assessment.

Potential Impacts by Resource

Wilderness

All alternatives would impact wilderness character to some degree. In the short term, the negative impact to the untrammeled quality under Alternative 2 would be greater than the negative impact to this quality under Alternative 1 or 3. Alternative 2 would have a greater benefit to the natural quality than Alternative 3, and both would have greater benefit to the natural quality than Alternative 1. Opportunities for solitude or unconfined type of recreation would be least impacted by Alternative 1, followed by Alternative 2 then Alternative 3.

Overall, Alternative 2 has the greatest benefit to wilderness character, followed by Alternative 3 then Alternative 1. Alternative 2 has limited negative short term impacts to some wilderness character qualities, but very strong long term benefits to the natural quality of wilderness character, and therefore Alternative 2 would do the most to preserve wilderness character. Project design elements (e.g. low toxicity herbicides, spot application) that limit the negative impacts of herbicides combined with OSG's that attempt to minimize effects to wilderness character (e.g. timing treatments with lower visitor use) would limit impacts of the project to wilderness character. The No Action Alternative would have the most negative effects on preserving wilderness character.

Human health

Alternatives 1 and 3 would have extremely low risks to human health. Safety practices would prevent impacts to the public from treating NNIP with manual methods. The use of herbicides for NNIP treatments in Alternative 2 would have a low risk of impacts to human health. The use of low toxicity herbicides, the low number of acres proposed for treatment, project design, and OSGs would all limit the risk of this alternative to human health.

Water Resources

The risk of negative effects to aquatic resources from Alternatives 1 and 3 are very low. The risk of negative effects from herbicide use in Alternative 2 is also low. Under Alternative 2 no water quality standards would be exceeded, and herbicide use would have a very low risk of negative effects to aquatic life. No herbicide would be discharged to water bodies under Alternative 2, and Alternative 2 would cause no water bodies to be added to Minnesota's Impaired Waters List. All alternatives would benefit aquatic habitat by controlling and eradicating NNIP. The benefit would be largest for Alternative 2.

Non-native invasive plants

Alternative 2 would result in the containment and eradication of the known NNIP infestations in the project area faster and with fewer re-treatments than Alternative 3. There would be much less NNIP spread during project implementation under Alternative 2 than Alternatives 1 or 3. There would be less ground disturbance associated with Alternative 2 than Alternative 1 or 3 so fewer NNIP seeds would germinate out of the soil under Alternative 2.

Native plants

Alternatives 1, 2, and 3 would not differ greatly in their effects to native plants. All three would have minor short term effects to native plants, with Alternative 2 having a higher likelihood of effects than Alternatives 1 and 3. However, in the long term all alternatives would benefit native plants. Native plant species recovery would happen quicker under Alternative 2 compared to the other alternatives.

Threatened and endangered species

None of the alternatives would negatively impact Canada lynx habitat. Under all alternatives, selectively removing NNIP from both known and future infestations would not negatively affect hare habitat or lynx denning habitat. The infestations sites are small and widely scattered across the BWCAW, and over 80% of the NNIP infestations are at sites frequented by humans like campsites, portages, trails, or old resort/cabin sites. This project would not involve construction

of any new access routes. Under Alternative 2 there would be no impacts of herbicide use to lynx because the herbicides proposed for use are low toxicity, the use would be very dispersed, and because the herbicide exposure routes involving lynx prey are very unlikely. All alternatives would help limit future impacts of NNIP to lynx. Alternative 1, Alternative 2, and Alternative 3 of the BWCAW NNIP Management Project would each have no effect on the Canada lynx or its critical habitat.

Regional Forester sensitive species

RFSS Terrestrial Wildlife

Alternative 1 would have no impact on heather vole, northern goshawk, boreal owl, great grey owl, wood turtle, Mancinus alpine, red disked alpine, Jutta arctic, Nabokov's blue, Freija's grizzled skipper, little brown myotis, northern myotis, tri-colored bat, gray wolf, or bald eagle.

Alternative 1 may impact individuals of olive sided fly catcher, bay breasted warbler, or Connecticut warbler, but is not likely to result in a trend towards federal listing or a loss of viability.

Alternative 2 would have no impact on northern goshawk, boreal owl, gray wolf, olive-sided flycatcher, little brown myotis, northern myotis, tri-colored bat, bay-breasted warbler, bald eagle, Connecticut warbler, three-toed woodpecker, great gray owl, Frieja's grizzled skipper, Taiga alpine, or Nabokov's blue.

Alternative 2 may impact individual Eastern heather vole, but is not likely to cause a trend to federal listing or a loss of viability.

Alternative 3 would have no impact on any terrestrial RFSS wildlife species.

RFSS Aquatic Wildlife

Alternative 1 would have no impact on shortjaw cisco, Nipigon cisco, headwaters chilostigman caddisfly, ebony boghaunter, and Quebec emerald.

Alternative 1 may impact individuals of lake sturgeon, northern brook lamprey, creek heelsplitter, and black sandshell but is not likely to result in a trend towards federal listing or a loss if viability.

Alternative 2 would have no impact on any aquatic RFSS species.

Alternative 3 would have no impact on any aquatic RFSS species.

RFSS Plants

For Alternative 1, the proposed activities would have no impact on alpine milkvetch, creeping rush, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes' pondweed, awlwort, lance-leaved violet, *Cladonia wainoi*, large-leaved sandwort, long leaved arnica, maidenhair spleenwort, Ross' sedge, sticky locoweed, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga, Arctoparmelia subcentrifuga,* Douglas

hawthorne, Appalachian fir clubmoss, small shinleaf, cloudberry, fairy slipper, ram's head ladyslipper, western Jacob's ladder, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa, Usnea longissima, Pseudocyphellaria crocata,* moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, Braun's holly fern, Canada yew, barren strawberry, Canada ricegrass, rough fruited fairy bells, or *Peltigera venosa*.

The proposed activities in Alternative 1 may impact individuals of common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, and least moonwort but are not likely to cause a trend to federal listing or loss of viability.

For Alternative 2, the proposed activities would have no impact on alpine milkvetch, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, creeping rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes pondweed, awlwort, lance-leaved violet, fairy slipper, ram's head ladyslipper, small shinleaf, cloudberry, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Pseudocyphellaria crocata, Ramalina thrausta, Sticta fuliginosa, Usnea longissima*, Ross' sedge, sticky locoweed, Canada ricegrass, rough-fruited fairybells, Canada yew, barren strawberry, *Peltigera venosa,* moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, false asphodel, and western Jacob's ladder.

For Alternative 2, the proposed activities may impact individuals of long-leaved arnica, maidenhair spleenwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, least moonwort, Douglas hawthorn, large-leaved sandwort, Appalachian fir clubmoss, Braun's holly fern, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, and *Cladonia wainoi* but are not likely to cause a trend to federal listing or loss of viability.

For Alternative 3, the proposed activities would have no impact on alpine milkvetch, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, creeping rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes pondweed, awlwort, lance-leaved violet, fairy slipper, ram's head ladyslipper, small shinleaf, cloudberry, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Pseudocyphellaria crocata, Ramalina thrausta, Sticta fuliginosa, Usnea longissima*, Ross' sedge, sticky locoweed, Canada ricegrass, rough-fruited fairybells, Canada yew, barren strawberry, *Peltigera venosa,* moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, false asphodel, and western Jacob's ladder.

For Alternative 3, the proposed activities may impact individuals of long-leaved arnica, maidenhair spleenwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, least moonwort, Douglas hawthorn, large-leaved sandwort, Appalachian fir clubmoss, Braun's holly fern, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, and *Cladonia wainoi* but are not likely to cause a trend to federal listing or loss of viability.

Wildlife

The manual treatments proposed under Alternatives 1 or 3 would not pose any risk to wildlife. For Alternative 2, risk assessments suggest there is no plausible risk to wildlife from treatments with aminopyralid, metsulfuron methyl, or imazapic. For triclopyr, the risk assessment suggests that birds or mammals eating contaminated vegetation could be at risk for negative effects, but the triclopyr treatments sites are very small and scattered so that few actual impacts to wildlife are expected. The benefits to wildlife habitat by controlling NNIP would be greater for Alternative 2 than Alternative 1 or 3.

Table of Contents

List of Tables

List of Figures

List of Appendices

CHAPTER 1: PURPOSE AND NEED

1.1 INTRODUCTION

The Superior National Forest has a unique opportunity to prevent some of the widespread ecological, social, and economic impacts caused by non-native invasive plants that plague other parts of the United States. In order to maintain and improve aquatic and terrestrial wildlife habitat, to maintain healthy, resilient native plant communities, and to maintain the character and ecological integrity of the Boundary Waters Canoe Area Wilderness (BWCAW), the Superior National Forest proposes to implement a non-native invasive plant management project, beginning with treatments on a total of approximately 14 acres at sites scattered across the 1.1 million acre wilderness and possibly expanding up to 40-60 acres over the next 10 years.

The proposed activities in the project area are intended to move vegetation from its existing condition toward the desired conditions as described in the Forest Plan. The proposed activities would eradicate or contain existing non-native invasive plant (NNIP) populations and respond rapidly to new infestations in order to prevent the further spread of NNIP. This project proposes an integrated pest management approach to achieve results, including use of both manual (e.g. handpulling) and herbicide control methods. This project focuses only on non-native invasive plants and proposes no management for aquatic invasive animals – they are beyond the scope of the project.

In addition to threatening native plant communities and wildlife habitat, NNIP also threaten qualities of the BWCAW itself. Several components of wilderness character are threatened, including the natural quality, outstanding opportunities for solitude or a primitive and unconfined type of recreation, and an additional component, the abundant lakes and streams. The threats to wilderness character have been analyzed by resource specialists and are disclosed in a Minimum Requirements Decision Guide (Appendix E MRDG – see Section 1.2 to access appendices), which describes the threats, determines if action is needed, and if action is needed, determines the minimum action required to maintain wilderness character.

Unlike many public lands elsewhere in the United States, the BWCAW has a low abundance of NNIP. Wilderness areas in the western United States such as the Frank Church River of No Return Wilderness and Selway-Bitterroot Wilderness have thousands of acres of NNIP and have been using herbicides as part of NNIP management for at least the last decade. The BWCAW, in contrast, has only approximately 14 acres of NNIP. These 14 acres are surrounded by thousands of acres of susceptible habitat such as rock outcrops and wetlands. Unfortunately, most of the NNIP in the BWCAW cannot be killed by hand pulling. Thus, we have a high-value habitat and an ineffective control method. These combine to create a threat to the ecological integrity and wilderness character of the BWCAW. These threats to the Wilderness are the reason there is a need to act now to limit impacts caused by NNIP.

Over the last ten years the Superior National Forest has been implementing an integrated pest management (IPM) program to combat non-native invasive species. This approach includes information and education, inventory and early detection, prevention, treatments, restoration, monitoring, and partnerships and coordination. A successful IPM program has been slowing the

spread of NNIP outside the Wilderness. Within the BWCAW, the Forest Service has been using manual methods such as digging up and removing plants to battle NNIP, but this approach is not keeping up with all of the NNIP that are showing up. For this reason, the Forest is proposing to include herbicides along with other methods in their IPM approach for the BWCAW.

On April 15, 2011 the Responsible Official, the Superior National Forest Supervisor, filed a Notice of Intent to prepare an Environmental Impact Statement (EIS) for the BWCAW NNIP Management Project (Federal Register: Vol. 77, No. 77, pages 22360 – 22361). This EIS was prepared by an interdisciplinary team of resource specialists in order to inform the Responsible Official and the public about the potential effects of the BWCAW NNIP Management Project proposed activities.

An important consideration in the preparation of this EIS is to reduce paperwork as specified in 40 CFR 1500.4. The objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental effects of the proposals and how any adverse effects could be mitigated or avoided.

The entire project planning record will be available at the Laurentian Ranger District Office in Aurora, Minnesota, upon issuance of the Record of Decision. Additional information is available at the district office and upon request. Other reference documents, such as the Forest Plan, associated Record of Decision and Final Environmental Impact Statement, are available at libraries around the region, as well as at all Superior National Forest offices and on the Forest website. Visit our website at www.fs.usda.gov/goto/superior/projects and look for the BWCAW NNIP Management Project.

1.2 ORGANIZATION OF THE ENVIRONMENTAL IMPACT STATEMENT

The Superior National Forest has prepared this Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EIS discloses the direct, indirect, and cumulative impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

Chapter 1 - Purpose and Need - The chapter includes information on the background of the project proposal, the purpose of and need for the project, the agency's proposal for achieving that purpose and need and the decision framework. This section also details how the agency informed the public of the proposal and how the public responded.

Chapter 2 - Alternatives – This chapter describes the no-action alternative and the action alternatives that are analyzed in detail in Chapter 3. This chapter also summarizes and compares environmental effects that would result from implementation of the alternatives, and includes a brief description of alternatives considered and not analyzed in detail.

Chapter 3 - Affected Environment and Environmental Effects - This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by issue and resource.

Chapter 4 – Consultation and coordination – This chapter provides a list of contributors to the EIS, the distribution list for the EIS, a definition of technical terms used in the EIS, a list of acronyms and abbreviations used in the EIS, a list of the references cited in the EIS, and an index.

Appendices - The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

Appendix A. BWCAW NNIP Map, east and west halves of project area
Appendix B. Operational Standards and Guidelines
Appendix C. Site-specific Design Criteria
Appendix D. Herbicide Information
Appendix E. Minimum Requirements Decision Guide
Appendix F. Herbicide Spill Response Plan
Appendix G. Table of Treatment Type and Location
Appendix H. Integrated Pest Management
Appendix I. Monitoring Plan
Appendix J. Past, Present, and Reasonably Foreseeable Actions
Appendix K. Scoping Comment Summary
Appendix L. Biological Assessment
Appendix M. Biological Evaluation
Appendix N. Response to Comments

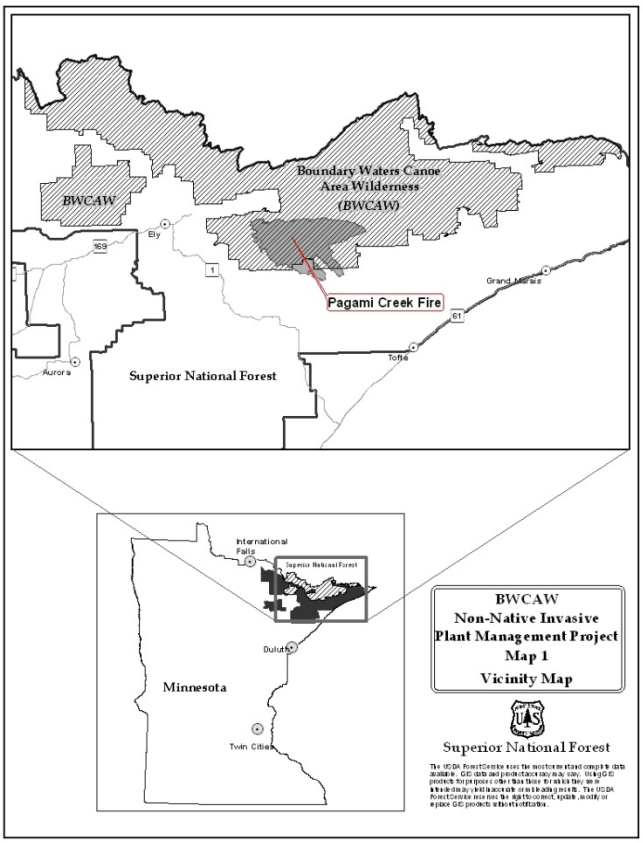
This document, the maps, and all of the appendices are available on request as well as on the Superior National Forest website. Visit our website at www.fs.usda.gov/goto/superior/projects and look for the BWCAW NNIP Management Project.

Additional supporting documentation may be found in the project planning record located at the Laurentian Ranger District, Aurora, MN

1.3 PROJECT LOCATION

The project area is located within the BWCAW in the northern third of the Superior National Forest and stretches approximately 150 miles along the international border with Canada. Project activities would occur in St. Louis, Lake, and Cook Counties and would occur on four ranger districts: LaCroix, Kawishiwi, Gunflint, and Tofte. The vicinity map (Figure 1) displays the general location of the project area. Although the BWCAW encompasses over one million acres, project activities would only occur on a total of approximately 14 acres (and possibly expanding up to 40-60 acres as new NNIP are found) scattered over 1137 locations. The locations of NNIP sites proposed for treatment are shown on proposed action maps in Appendix A (see Section 1.2 to access appendices).

Figure 1. Vicinity Map



1.4 PURPOSE AND NEED FOR ACTION

We are approaching a "tipping point" but still have an opportunity to minimize the introduction and spread of NNIP in the BWCAW. Compared to many other wilderness areas, the occurrence of NNIP in the BWCAW is relatively low. Most NNIP species are found on campsites and portages, yet they are surrounded by thousands of acres of susceptible habitat such as rock outcrops and wetlands, and thus threaten native plant communities and wilderness character. Unfortunately, most of the NNIP in the BWCAW cannot be killed by hand pulling. So there is a high-risk habitat and an ineffective control method, and these combine to create a threat to the ecological integrity of the BWCAW.

In order to maintain and improve aquatic and terrestrial wildlife habitat, to maintain healthy, resilient native plant communities, and to maintain the character and ecological integrity of the BWCAW, there is a need to implement an integrated pest management approach that eradicates or contains existing NNIP infestations and provides for a rapid response to new infestations. We propose to implement NNIP management activities, including manual and herbicide control methods, over a ten-year period in the BWCAW.

The Forest Plan (USDA Forest Service 2004 [see D-VG-1, D-VG-3, D-WL-1, D-WL-6, D-WL-9, O-WL-37, O-WL-38]) directs us to work to establish native vegetation communities and aquatic and terrestrial wildlife habitats that are diverse, productive, healthy, and resilient. Native plants should dominate all terrestrial and aquatic ecosystems, with non-native plants forming at most a minor component. The Forest Plan directs us to reduce the spread of terrestrial or aquatic non-native invasive species that pose a risk to native ecosystems. In the BWCAW, the plan directs us to work toward the removal of non-indigenous species and preservation of the natural ecosystem (p. 3-60). Specifically, the Plan's objective (O-WL-38) is to use integrated pest management to:

- Eradicate any populations of new invaders,
- Contain or eradicate populations of recent invaders that have not become widespread yet,
- Limit the spread of widespread, established invaders.

The proposed action addresses the purpose and need and moves the resource condition in the project area towards the desired conditions established by the Forest Plan.

1.5 CHANGED CONDITION – PAGAMI CREEK FIRE

After scoping was completed in May 2011, a large wildfire occurred in the BWCAW and changed the conditions in a large part of the project area. The Pagami Creek Fire was started by a lightning strike in the BWCAW on August 18, 2011, and by the time most fire activity ended in the fall of 2011, the Pagami Creek Fire had burned 92,682 acres (see vicinity map in section 1.3). Approximately 84,158 acres (about 90%) of the fire, is within the project area for this project. Overall, approximately 7.5% of the project area was affected by the Pagami Creek Fire.

The Pagami Creek Fire created an area that is at especially high risk for NNIP invasion. Bare ground created by a high severity burn (approximately 60% of the fire) as well as lack of shade and lack of competing native vegetation will make good conditions in the short term for NNIP in this part of the project area. Known NNIP locations in the burned area and visitor use of the burned area increase the risk that NNIP will spread. To account for this changed condition, the proposed action described in the scoping report was changed to allow for increased NNIP treatment as described below.

1.6 PROPOSED ACTION

The BWCAW NNIP Management Project's Responsible Official, the Forest Supervisor of the Superior National Forest, distributed a scoping package in April 2011 to inform the public of the project and invited them to submit comments. The scoping package included a "Proposed Action" which outlined the management activities the interdisciplinary team had determined would move the project area towards the desired future conditions described in the Forest Plan. The proposed action described here is similar to the proposed action in the scoping report; the methods proposed for use are the same, but the scale of the treatments are larger to incorporate new 2011 field data (14 acres of known NNIP rather than 13 acres) as well as the changes caused by the Pagami Creek Fire (40-60 acres of projected new NNIP infestations rather than 7 acres).

The interdisciplinary team of resource specialists developed the proposed action using the most up-to-date NNIP data available. The interdisciplinary team not only used their technical

expertise and knowledge in developing the proposed action, they also made use of Forest and District NNIP monitoring information. NNIP monitoring results from the 2005 Alpine Lake Fire and annual herbicide treatment effectiveness monitoring for herbicide treatments outside the BWCAW were especially helpful. Of recent fires, the Alpine Lake Fire was the one where NNIP were monitored and documented most closely. Monitoring and evaluation have shown that past projects with the kinds of activities proposed can effectively meet the project's purpose and need.

We have an opportunity to prevent widespread degradation of terrestrial and aquatic ecosystems in the BWCAW. The Forest Service proposes to manage NNIP populations using an integrated combination of control methods based on the species and site. These control methods would include hand pump or sponge herbicide application and manual control methods. The sites proposed for treatment are shown on proposed action maps in Appendix A and a table in Appendix G (see Section 1.2 to access appendices). Table 1 summarizes the proposed treatments.

Table 1. Treatment Summary for Proposed Action

KNOWN NNIP LOCATIONS				
Species Name	**Total acres**	**Acres manual control**	**Acres using herbicide**	**Herbicide**
Bull thistle	0.07	0.07		
Canada thistle	2.9		2.9	Aminopyralid
Cypress spurge	0.1		0.1	Imazapic
Goutweed	1.8		1.8	Metsulfuron methyl
Non-native hawkweeds	2.8		2.8	Aminopyralid
Leafy spurge	0.02		0.02	Imazapic
Oxeye daisy	1.5		1.5	Aminopyralid
Purple loosestrife	0.3		0.3	Triclopyr
Siberian peabush	0.0002		0.0002	Triclopyr
Spotted knapweed	3.4	3.4		
St. Johnswort	0.004		0.004	Metsulfuron methyl
Tansy	1.4		1.4	Metsulfuron methyl
Tatarian honeysuckle	0.02		0.02	Triclopyr
TOTALS (known infestations)	**14.3**	**3.5**	**10.8**	
PROJECTED FUTURE NNIP LOCATIONS				

Approximately 40-60 acres of herbicide or manual treatments

This project was designed with many resources in mind: human health and safety, fish and wildlife, water, and recreation. Impacts to wilderness were one important consideration during development of the proposed action. The Minimum Requirements Decision Guide (Appendix E MRDG - see Section 1.2 to access appendices) concluded that the minimum tools necessary to manage NNIP in the BWCAW effectively were manual methods (e.g. pulling, digging, cutting) and herbicide application. Manual methods would be used for the tap-rooted species bull thistle and spotted knapweed; pulling one of these species and getting the whole taproot kills the plant. Herbicide application would be used for the remaining species which have rhizomatous root systems that make manual methods ineffective (a rhizome is a horizontal underground root). For rhizomatous species, manual methods are ineffective for eradication because root fragments remain in the soil after pulling, allowing the plants to resprout and continue to spread. Furthermore, pulling causes disturbance of the upper layers of soil which encourages sprouting of weed seeds from the soil seed bank.

Because the interdisciplinary team anticipates that new infestations will be found both in the Pagami Creek Fire burned area as well as elsewhere in the project area, this alternative proposes to treat approximately 40-60 acres of new infestations in the project area in addition to the approximately 14 acres of known infestations. The sites shown in Appendix A would be targeted for treatment initially, but in order to respond rapidly to new infestations detected in the next ten years, up to 40-60 more acres than what is currently infested may be treated.

The interdisciplinary team considered numerous risk factors for increased NNIP spread in the Pagami Creek burned area, the most important being locations of known NNIP infestations, and the locations where visitor use (and subsequent NNIP spread) would be highest – portages and campsites in the burned area. The IDT took these factors into account, as well as our experience with NNIP spread resulting from the 2005 Alpine Lake Fire.

The interdisciplinary team used a combination of professional judgement and NNIP monitoring data from the 2005 Alpine Lake Fire to forecast the approximately 40-60 acres of additional NNIP spread expected in the Pagami Creek Fire burned area if a combination of manual methods and herbicides are used. Using the NNIP spread rate that was observed in the Alpine Lake Fire burned area, the team forecast approximately 20 acres of spread in 2012 and 40 additional acres in 2013. In 2013 under the proposed action we would implement herbicide and manual methods of NNIP control. Outside the BWCAW where we treat NNIP with herbicide, the treatment effectiveness rate is approximately 80% (USDA Forest Service 2011). Assuming this treatment effectiveness holds in the BWCAW, we expect the approximately 40-60 acres of NNIP to plateau at that amount and gradually decline.

We use a standard, agency-wide method to measure the abundance (i.e. acreage) of NNIP (USDA Forest Service 2012). We would continue to use these methods in the future. Because of this consistency, it is our professional opinion that the 40-60 acre future NNIP abundance estimate will be adequate to address future infestations during the lifespan of this project.

These treatments would occur over the next ten years. A ten-year treatment period is needed because many of the species listed in Table 1 produce seed that remains viable in the soil for 7-10 years or more (Schultz 2011); therefore, follow-up treatments would be needed as described below. Implementation would begin in summer 2013. Of the 1137 known NNIP occurrences, most occur on campsites (48%), while others occur on portages or trails (26%), along shorelines (13%), at old resort/cabin sites (7%), or in burned areas (6%).

While developing the proposed action, the interdisciplinary team collaborated with the St. Louis County Cooperative Weed Management Area, Cook County Cooperative Weed Management Area, county and state land managers, and Tribal representatives. The collaborative effort was used to ensure coordinated NNIP management activities would occur across ownership boundaries.

1.6.1 Herbicide Treatment

Herbicides would be used for large brushy species or for herbaceous species for which manual controls are ineffective. Specific herbicides were selected based on their effectiveness and low toxicity. All herbicides proposed for use are registered with the Environmental Protection Agency and are general use herbicides. Table 2 summarizes the herbicides proposed for use and their targeted use. For more information about the environmental characteristics and toxicities of the herbicides, please see Appendix D (see Section 1.2 to access appendices). Risk assessments are also available for all of the herbicides at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

Table 2. Proposed Herbicides and Treatment Methods

Common chemical name	Example of trade names	Targeted Use	Weeds targeted
Triclopyr[1]	Garlon3A®; Renovate®	Stump treatment, foliar treatment; broadleaf-selective	Siberian peabush, Tatarian honeysuckle, purple loosestrife
Imazapic	Plateau®	Foliar treatment, non-selective	Leafy spurge, Cypress spurge
Aminopyralid	Milestone® VM	Foliar treatment; broadleaf selective	Canada thistle, Hawkweeds, Oxeye Daisy
Metsulfuron methyl	Escort XP®	Foliar treatment; broadleaf selective	Tansy, St. Johnswort, Goutweed

[1] For more information about the environmental characteristics and toxicity of these herbicides, please see Appendix D.

All herbicides would be used according to manufacturer label direction (e.g., regarding rates, concentrations, frequency of application, and application methods). All herbicides would be applied using ground-based spot application; no aerial application would be used. Spot application directs herbicides to target plants with minimal exposure to humans, desirable vegetation, or other non-target organisms. Two pieces of equipment would be used for spot application: a small hand pump connected to a spray wand (Figure 2), and a wipe-on applicator (Figure 2). Wipe on methods involve rubbing a sponge wetted with herbicide against a leaf surface or a cut stump; this method would be used for purple loosestrife (unless standing water is present around the base of the purple loosestrife at the time of treatment in which case

handpulling would be used), on NNIP on rock outcrops next to waterbodies, and for stump treatments of woody species. The hand pump would be used for spot application on NNIP located more than 25 feet from water. There would be one herbicide application per site per year with follow-up monitoring and possible treatment in subsequent years, consistent with label directions regarding application frequency.

Estimates of the maximum amount of herbicide used in one field season of this project are shown in Table 3. This table assumes that all sites would be treated in a given year; the actual herbicide use in a given year is likely to be less than that shown in Table 3 and would be determined by annual funding, weather, etc. On any given eight-day work trip by a field crew to treat NNIP, the amount of herbicide carried by the field crew would typically be approximately 5-15 fluid

Figure 2. Examples of Hand Pumps and Wipe on Applicator

Table 3. Herbicide Use Estimates

Herbicide[1]	Application Rate	NNIP Acres	Maximum Annual Use[2]
Aminopyralid (used for 82% of sites)	5 fl. oz./acre	7.2 acres	36 fl. oz
Imazapic (used for <1% of sites)	10 fl. oz./acre	0.15 acre	1.5 fl. oz.
Metsulfuron methyl (used for 3% of sites)	1 oz./acre	3.2 acres	3.2 oz.
Triclopyr (used for 7% of sites)	192 fl. oz./acre	0.33 acre	63 fl. oz.

[1] Remaining 7% of sites would be treated with manual methods
[2] This assumes every possible known site would be treated in one year, which may not occur due to limited resources, weather conditions, etc.

ounces. To reduce the risk of accidental spills, herbicide containers would be transported inside a second watertight container (see Appendix F for spill response plan). Figure 3 shows a visual demonstration of the maximum amount of herbicide that would be used in one year as well as a transport container. The five water bottles in the foreground of Figure 3 demonstrate the

maximum amount of herbicide that would be used in a single field season. The blue barrel has a watertight lid and would be used to transport the herbicides and application equipment. The digging tools in the foreground would be used to help cut or dig NNIP.

Any given infestation would require at least two treatments: one primary treatment and then another follow-up treatment the next year, consistent with label directions regarding application frequency. For small infestations, two treatments would probably eliminate the infestation. For larger infestations, two to four years of follow-up treatments would likely be required. For follow-up treatments, the amount of effort at a site would decrease dramatically after the first year of treatment. Any given weed infestation would be treated once per season. The time of application depends somewhat on the target species, but would generally be during the growing season, from late-May through mid-October.

Figure 3. NNIP treatment tools. The five one-liter water bottles demonstrate the maximum amount of herbicide that would be used in a given year for treating all known infestations – the equivalent of one of those would be taken on any one trip to treat NNIP. For actual treatments, herbicides would be transported in original containers with intact labels.

Figure 4. Example of manual removal of NNIP

1.6.2 Manual Treatment

Manual treatments would be conducted on the tap-rooted species bull thistle and spotted knapweed. The plant and its tap root would be removed from the ground by pulling or cutting the root. After treatment, NNIP remains would be disposed of in such a way as to prevent them from starting a new infestation elsewhere. Some combination of the following disposal methods would be used, depending on the situation.

- Placing NNIP in a sturdy plastic bag (such as the liner bags used to line Duluth packs), securely closing bag, and packing out of the BWCAW inside of a Duluth pack. The bag would be checked periodically to make sure there were no holes.
- Burning NNIP in a fire grate at a campsite and ensuring that the NNIP are completely combusted
- Leaving plant remains on the ground or strewn on shrubs so they dry out. This would be used when plants are still in the bud stage prior to flowering when there is no risk of seed dispersal from the pulled plants. The plants would be placed in shady locations such as under shrubs or balsam fir under a tree canopy, where these shade-intolerant species would not be likely to persist. They would not be buried which could allow roots to contact soil and continue growth. Rather, they would be placed on branches or on the ground surface where rooting is unlikely. Experience over the last several years has shown that placement of NNIP like this leads to the plants desiccating and dying.

Factors that determine the method of disposal are: ripeness or unripeness of the seeds, seed dispersal mechanism (windborne versus waterborne), whether the species is a wetland or upland species, whether vegetative fragments can start new plants, and ease of transporting the plants.

Any given infestation would require at least two treatments: one primary treatment and one or more follow-up treatments in subsequent years. For small infestations, approximately 2-3 treatments would probably eliminate the infestation. For larger infestations, up to approximately 3-5 years of follow-up treatments would likely be required. For follow-up treatments, the amount of effort at a site would decrease dramatically after the first year of treatment. Any given weed infestation would be treated once per season. The time of treatments depends somewhat on the target species, but would generally be during the growing season, from late-May through mid-October.

1.6.3 Operational Standards and Guidelines and Monitoring

Forest Plan operational standards and guidelines that would be implemented if any action is approved are summarized in Appendix B, Operational Standards and Guidelines, and Appendix C, Site-Specific Design Criteria (see Section 1.2 to access appendices). The documents include the standards and guidelines that are routinely employed during NNIP management as well as site-specific protection measures.

In addition to identifying the appropriate standards and guidelines, the interdisciplinary team developed monitoring activities (Appendix I). The monitoring activities would be used to assess whether or not management activities were implemented as planned. In addition to resource specific monitoring, such as for NNIP treatment effectiveness, project interdisciplinary teams

review entire projects periodically to compare how the project as a whole meets the overall direction provided in the analysis documents. Finally, on-going Forest Plan monitoring would also be used to determine the effectiveness of standards and guidelines.

1.6.4 Decisions to Be Made

Authority for this decision has been delegated by the Eastern Region Regional Forester to the Forest Supervisor for the Superior National Forest. Decisions to be made include:

- What actions will be approved to address the purpose and need
- Where will those actions take place
- Are any mitigation measures needed to further limit effects of approved actions
- Any monitoring of approved actions

A decision is expected in summer 2013 with implementation expected to begin in fall 2013. Treatments would continue under this decision for up to ten years, and actions beyond ten years would require subsequent analysis and decision. If no action is selected, the proposed activities would not occur under this analysis.

1.7 PUBLIC INVOLVEMENT

The interdisciplinary team conducted scoping and public involvement activities to inform the public and to determine the issues associated with the proposed action. The scoping package was mailed to about 400 individuals, landowners, Tribal governments, and agencies considered to have potential interest in the BWCAW NNIP Management Project because they lived or had business interests within or adjacent to the Project area boundaries or they asked to be on the Forest-wide mailing list. The Scoping Package was mailed to the public on April 18, 2011. The Notice of Intent was published in the Federal Register on April 21, 2011. A legal notice was published in the Duluth News Tribune on April 22, 2011.

The scoping period ended on May 23, 2011, and the Forest Supervisor received approximately 13 comment letters on the proposed action. The comments were analyzed and used to develop issues which are described below. Appendix K contains the summary of public comments with Forest Service responses.

A notice of availability of the Draft EIS for the BWCAW NNIP Management Project was published on February 1, 2013 (Federal Register: Volume 78, Number 22, page 7427). The DEIS was mailed to 36 individuals, landowners, tribal governments, and agencies on January 25, 2013. The comment period ended on March 18, 2013. Eleven comments on the DEIS were received. Appendix N contains a summary of public comments on the DEIS with Forest Service responses.

1.8 TRIBAL INVOLVEMENT

During development of the project, the Superior National Forest coordinated with local bands as well as the 1854 Treaty Authority. The Superior National Forest met with the Fond du Lac Band of Lake Superior Chippewa, Bois Forte Band of Chippewa, Grand Portage Band of Lake Superior Chippewa, and 1854 Treaty Authority prior to scoping the project with the public. The

concerns identified during consultation with the bands were incorporated into the design of the BWCAW NNIP Management Project. No issues were identified by the bands during scoping.

Prior to the release of the DEIS, the Superior National Forest met with the Bois Forte Band of Chippewa to brief them on this project. The Superior National Forest also coordinated with resource managers from the Fond du Lac Band of Lake Superior Chippewa, Grand Portage Band of Lake Superior Chippewa, and 1854 Treaty Authority prior to release of the DEIS. One concern was raised, balancing the risk of impacts to wild rice from herbicide use versus the risk of impacts from purple loosestrife invasion. This concern was addressed in the DEIS and is also addressed in Appendix N (Response to Comments).

1.9 ISSUES

Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand. Issues were identified from comments gathered through the scoping process. Many of the public comments were addressed through project design or application of Forest Plan standards and guidelines.

Significant issues result when the proposed action may cause a significant environmental effect. A significant effect is based on the context and intensity of the effect. Based on her review of the scoping comments, the scoping report, and her reviews of NNIP management with herbicides outside of the BWCAW, the Responsible Official does not expect the BWCAW NNIP Management Project to cause significant effects. Therefore, there are no significant issues for this project.

Through the analysis of public scoping comments, the Responsible Official identified one issue that represented an unresolved conflict with the proposed action, and this issue drove the development of an additional alternative. The interdisciplinary team also developed an indicator for this issue to compare the environmental impacts of the alternatives. This issue and indicator are described below and in the wilderness section of Chapter 3 of this Final EIS.

Wilderness character

The public raised a concern about the effects of herbicide on two components of wilderness character – trammeling and an unconfined type of recreation. The concern was that herbicide use for NNIP treatments would adversely impact these components of wilderness character.

This issue is addressed in Alternative 3 by limiting herbicide treatments to manual methods only.

Indicators: effects to wilderness character, specifically the level of trammeling and effects to the natural quality and outstanding opportunities for solitude or unconfined types of recreation.

Through the analysis of public scoping comments, the Responsible Official identified several other issues that do not drive alternatives: water quality, human health and safety, wildlife,

native plants, and the effects of activities adjacent to the BWCAW on NNIP spread. They are analyzed in Chapter 3 of this Final EIS. These issues are summarized in Appendix K.

1.10 RESOURCES ANALYZED IN DETAIL

Analysis in Chapter 3 includes the following resources and topics that address the potential environmental impacts of the alternatives. The EIS is tiered to the 2004 Superior National Forest Plan EIS as supported by the National Environmental Policy Act and 40 CFR 1502.20. Relevant discussions from these documents are incorporated by reference in the EIS rather than repeated (40 CFR 1502.21). This EIS incorporates by specific reference the project record. The project record contains the technical reports prepared by the interdisciplinary team members, as well as other information including maps, field notes, and data used to support the analysis and conclusions that are disclosed in this EIS. It is considered an unpublished appendix to the EIS.

The resources to be analyzed in detail include:

1. Wilderness
2. Human health
3. Water Resources
4. Non-native invasive plants
5. Native plants
6. Threatened and endangered species
7. Regional Forester sensitive species
8. Wildlife

CHAPTER 2: COMPARISON OF ALTERNATIVES

2.1 INTRODUCTION

This chapter describes and compares the alternatives considered for the BWCAW NNIP Management Project. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative and some of the information is based upon the environmental and social effects of implementing each alternative.

2.2 ALTERNATIVES CONSIDERED IN DETAIL

The interdisciplinary team developed three alternatives in response to the wilderness character issue raised by the public:

- Alternative 1 is No Action.
- Alternative 2 is the Proposed Action. This is the agency preferred alternative.
- Alternative 3 is using manual methods only to manage NNIP.

Alternative 3 responds to the public concern about herbicide impacts to wilderness character. Alternative 3 limits NNIP treatments to manual control methods only. There is no alternative that analyzes an option of no NNIP treatments whatsoever; this alternative was already analyzed in the 2006 Superior National Forest Non-native Invasive Plant Management Environmental Assessment (USDA Forest Service 2006). If the no action alternative is selected for the BWCAW NNIP Management Project, the Superior National Forest would not revert to doing no NNIP management in the BWCAW. Rather, the Superior National Forest would revert to working under the 2006 Decision Notice (DN) which authorized manual control methods for NNIP in the BWCAW. This existing management direction allows for manual control methods in the BWCAW (although at less acreage than proposed in Alternative 3) and the rest of the Superior National Forest.

Applicable operational standards and guidelines (Appendix B) and site-specific design criteria (Appendix C) would be followed for both action alternatives.

2.2.1 Alternative 1 - No Action

Under the no action alternative the Superior National Forest would implement the existing management decision from the 2006 DN and use manual treatment methods to treat approximately 5.5 acres of NNIP that were known in the BWCAW in 2006 plus the approximately 8.8 acres of NNIP that have been found since then for a total of 14.3 acres, or in other words, all the known NNIP in the wilderness. The 2006 DN allowed for treating all the NNIP acres known on the Superior National Forest (145.9 acres) in 2006 plus an additional 50% (73 acres) as new infestations are found; NNIP found in the BWCAW are part of this total. The Superior National Forest is treating what is approximately the BWCAW's "share" of the acres considered in the 2006 DN annually.

Some conditions have changed since the 2006 DN, such as the Pagami Creek Fire, and the 2006 DN does not account for these changes. Under the 2006 DN, the annual treatment acreage could be increased, but the increase would come at the expense of treatment acres outside the BWCAW and would not be enough to treat the NNIP spread expected as a consequence of the Pagami Creek Fire. For the analysis that follows, we consider 14.3 acres the amount proposed for treatment under Alternative 1.

An integrated pest management approach (with the exception of no herbicides) would be used. We would also continue to implement existing programs of prevention, coordination, inventory and monitoring, and education to reduce the risk of future NNIP impacts. For more information on the Forest's integrated pest management actions, please see Appendix H.

Table 4 shows a summary of the species and acres proposed for treatment with manual methods. The sites proposed for treatment are shown on proposed action maps in Appendix A and a table in Appendix G (see Section 1.2 to access appendices).

Table 4. Treatment Summary for Alternative 1

KNOWN NNIP LOCATIONS	
Species Name	**Acres of manual control**
Bull thistle	0.07
Canada thistle	2.9
Cypress spurge	0.1
Goutweed	1.8
Non-native hawkweeds	2.8
Leafy spurge	0.02
Oxeye daisy	1.5
Purple loosestrife	0.3
Siberian peabush	0.0002
Spotted knapweed	3.4
St. Johnswort	0.004
Tansy	1.4
Tatarian honeysuckle	0.02
TOTALS (known infestations)	**14.3**

These treatments would occur until 2016, which is the time frame permitted under the 2006 DN. This time frame would allow for some follow-up treatment, which is needed because many of the species listed in Table 4 produce seed that remains viable in the soil for 7-10 years or more (Schultz 2011); therefore, follow-up treatments would be needed as described below. Implementation under this decision began in 2006. Of the 1137 known NNIP occurrences, most occur on campsites (48%), while others occur on portages or trails (26%), along shorelines (13%), at old resort/cabin sites (7%), or in burned areas (6%).

Manual treatments would be conducted on all the species listed in Table 4 by pulling, cutting, or digging the plants. The tap-rooted species spotted knapweed and bull thistle would be eradicated by pulling or cutting the tap root and aboveground growth. The remaining species are all rhizomatous (a rhizome is a horizontal underground root). Rhizomatous species would be pulled, cut, or dug to remove the aboveground growth (especially the flowers and seeds) and a portion of the roots. Removing all of the roots for every plant is not a reasonable expectation due to how they spread underground.

After treatment, NNIP remains would be disposed of in such a way as to prevent them from starting a new infestation elsewhere. Some combination of the following disposal methods would be used, depending on the situation.

- Placing in a sturdy plastic bag (such as the liner bags used to line Duluth packs), securely closing bag, and packing out of the BWCAW. The bag would be checked periodically to make sure there were no holes.
- Burning in a fire grate at a campsite and ensuring that the NNIP are completely combusted
- Leaving plant remains on the ground or strewn on shrubs so they dry out. This would be used when plants are still in the bud stage prior to flowering when there is no risk of seed dispersal from the pulled plants. The plants would be placed in shady locations such as under shrubs or balsam fir under a tree canopy, where these shade-intolerant species would not be likely to persist. They would not be buried which could allow roots to contact soil and continue growth. Rather, they would be placed on branches or on the ground surface where rooting is unlikely. Experience over the last several years has shown that placement of NNIP like this leads to the plants desiccating and dying.

Factors that determine the method of disposal are: ripeness or unripeness of the seeds, seed dispersal mechanism (windborne versus waterborne), whether the species is a wetland or upland species, whether vegetative fragments can start new plants, and ease of transporting the plants.

Any given infestation would require at least two treatments: one primary treatment and one or more follow-up treatments in subsequent years. For small infestations of tap-rooted species, approximately 2-3 treatments would probably eliminate the infestation. For small infestations of rhizomatous species, approximately 3-5 treatments would probably eliminate the infestation. For larger infestations, up to 3-5 or approximately ten years of follow-up treatments would likely be required for tap-rooted and rhizomatous species, respectively. For follow-up treatments, the amount of effort at a site would decrease after the first year of treatment. Any given weed infestation would be treated once per season. The time of treatments depends somewhat on the target species, but would generally be during the growing season, from late-May through mid-October.

2.2.2 Alternative 2 – Proposed Action (Preferred Alternative)

The current proposed action was developed based on the proposed action that was included in the scoping report and incorporates 2011 field information and the changed conditions caused by the Pagami Creek Fire. The two primary changes are proposing to treat 14 acres of known NNIP

rather than 13 acres and proposing to treat approximately 40-60 acres of forecast new infestations rather than 7 acres of new infestations. The proposed action would use a combination of herbicides and manual treatment methods to contain or eradicate NNIP in the BWCAW. An integrated pest management approach would be used. This means that not only would the Superior National Forest implement treatments proposed here, we would also continue to implement existing programs of prevention, coordination, inventory and monitoring, and education to reduce the risk of future NNIP impacts. For more information on the Forest's integrated pest management actions, please see Appendix H. For a full description of the proposed action, please see section 1.6.

2.2.3 Alternative 3 – Manual Methods Only

Under Alternative 3 the Superior National Forest proposes to use manual treatment methods to treat approximately 14 acres of known NNIP infestations plus approximately 600-650 acres of new NNIP infestations. An integrated pest management approach would be used. This means that not only would the Forest implement treatments proposed here, we would also continue to implement existing programs of prevention, coordination, inventory and monitoring, and education to reduce the risk of future NNIP impacts. For more information on the Forest's integrated pest management actions, please see Appendix H.

The interdisciplinary team of resource specialists developed Alternative 3 using the most up-to-date NNIP data available. The interdisciplinary team not only used their technical expertise and knowledge in developing Alternative 3, they also made use of Forest and District NNIP monitoring information, in particular NNIP monitoring results from the 2005 Alpine Lake Fire. Of recent fires, the Alpine Lake Fire was the one where NNIP were monitored and documented most closely.

Table 5 shows a summary of the species and acres proposed for treatment with manual methods. The sites proposed for treatment are shown on proposed action maps in Appendix A and a table in Appendix G (see Section 1.2 to access appendices).

Table 5. Treatment Summary for Alternative 3

KNOWN NNIP LOCATIONS	
Species Name	**Acres of manual control**
Bull thistle	0.07
Canada thistle	2.9
Cypress spurge	0.1
Goutweed	1.8
Non-native hawkweeds	2.8
Leafy spurge	0.02
Oxeye daisy	1.5
Purple loosestrife	0.3
Siberian peabush	0.0002
Spotted knapweed	3.4

St. Johnswort	0.004
Tansy	1.4
Tatarian honeysuckle	0.02
TOTALS (known infestations)	**14.3**
PROJECTED FUTURE NNIP LOCATIONS	
Approximately 600-650 acres of manual treatments (Note: a greater treatment acreage is proposed because manual treatment methods are not as effective and a greater amount of NNIP spread is anticipated under Alternative 3. See Section 3.4 for more details.)	

Because the interdisciplinary team anticipates that new infestations will be found both in the Pagami Creek Fire burned area as well as elsewhere in the project area, this alternative proposes to treat approximately 600-650 acres of new infestations in the project area in addition to the approximately 14 acres of known infestations. The sites shown in Appendix A would be targeted for treatment initially, but in order to respond rapidly to new infestations detected in the next ten years, up to 600-650 more acres than what is currently infested may be treated with manual methods.

The IDT considered numerous risk factors for increased NNIP spread in the Pagami Creek Fire burned area, the most important being locations of known NNIP infestations, and the locations where visitor use (and subsequent NNIP spread) would be highest – portages and campsites in the burned area. The IDT took these factors into account, as well as our experience with NNIP spread resulting from the 2005 Alpine Lake Fire. With the Alpine Lake Fire, monitoring showed that in spite of hand pulling NNIP, approximately 10% of the burned area became infested with NNIP over five years. The interdisciplinary team used a combination of professional judgement and this monitoring data to forecast that approximately 600-650 acres of additional NNIP spread would be expected in the Pagami Creek Fire burned area if manual NNIP control methods are used.

These treatments would occur over the next ten years. A ten-year treatment period is needed because many of the species listed in Table 54 produce seed that remains viable in the soil for 7-10 years or more (Schultz 2011); therefore, follow-up treatments would be needed as described below. Implementation under this decision would begin in summer 2013. Of the 1137 known NNIP occurrences, most occur on campsites (48%), while others occur on portages or trails (26%), along shorelines (13%), at old resort/cabin sites (7%), or in burned areas (6%).

Manual treatments would be conducted on all the species listed in Table 5 by pulling, cutting, or digging the plants. The tap-rooted species spotted knapweed and bull thistle would be eradicated by pulling or cutting the tap root and aboveground growth. The remaining species are all rhizomatous (a rhizome is a horizontal underground root). Rhizomatous species would be pulled, cut, or dug to remove the aboveground growth (especially the flowers and seeds) and a portion of the roots. Removing all of the roots for every plant is not a reasonable expectation due to how they spread underground.

After treatment, NNIP remains would be disposed of in such a way as to prevent them from starting a new infestation elsewhere. Some combination of the following disposal methods would be used, depending on the situation.

- Placing in a sturdy plastic bag (such as the liner bags used to line Duluth packs), securely closing bag, and packing out of the BWCAW. The bag would be checked periodically to make sure there were no holes.
- Burning in a fire grate at a campsite and ensuring that the NNIP are completely combusted
- Leaving plant remains on the ground or strewn on shrubs so they dry out. This would be used when plants are still in the bud stage prior to flowering when there is no risk of seed dispersal from the pulled plants. The plants would be placed in shady locations such as under shrubs or balsam fir under a tree canopy, where these shade-intolerant species would not be likely to persist. They would not be buried which could allow roots to contact soil and continue growth. Rather, they would be placed on branches or on the ground surface where rooting is unlikely. Experience over the last several years has shown that placement of NNIP like this leads to the plants desiccating and dying.

Factors that determine the method of disposal are: ripeness or unripeness of the seeds, seed dispersal mechanism (windborne versus waterborne), whether the species is a wetland or upland species, whether vegetative fragments can start new plants, and ease of transporting the plants.

Any given infestation would require at least two treatments: one primary treatment and one or more follow-up treatments in subsequent years. For small infestations of tap-rooted species, approximately 2-3 treatments would probably eliminate the infestation. For small infestations of rhizomatous species, approximately 3-5 treatments would probably eliminate the infestation. For larger infestations, up to 3-5 or approximately ten years of follow-up treatments would likely be required for tap-rooted and rhizomatous species, respectively. For follow-up treatments, the amount of effort at a site would decrease after the first year of treatment. Any given weed infestation would be treated once per season. The time of treatments depends somewhat on the target species, but would generally be during the growing season, from late-May through mid-October.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need. Alternatives not carried forward for detailed study are described below.

Alternative 4 – Scoping Report Proposed Action
The Responsible Official distributed a scoping package to inform the public of the BWCAW NNIP Management Project. The scoping package included a proposed action which outlined the management activities the interdisciplinary team had determined would move the project area towards desired future conditions described in the Forest Plan.

The original proposed action is not carried forward for detailed analysis primarily because the Pagami Creek Fire changed conditions in the project area such that the scoping report proposed action would not adequately address the purpose and need (see Section 1.5).

Alternative 5 – Alternative Using Biological Control
One public comment suggested using biological controls for the NNIP in the BWCAW. As the comment pointed out, biological controls are a valid treatment method used by multiple agencies, including the Minnesota Department of Natural Resources as well as the Superior National Forest on a few purple loosestrife populations on the Laurentian Ranger District. Biological control is often used as one component of an integrated pest management program (Wilson and Randall 2002) when it fits with the objectives of the pest management program.

Biological control was not selected as a treatment option for the BWCAW NNIP Management Project because it does not efficiently meet the purpose and need of the project, considering the current scale of NNIP infestation. Successful biological control works by introducing natural enemies (e.g. insects from the region where the NNIP originated) to NNIP that otherwise have none. In the best case these agents exert pressure on the NNIP population (e.g. by eating NNIP seeds, leaves roots, flowers, etc.) and reduce the dominance of the NNIP to an acceptable level (Wilson and McCaffrey 1999). Biological controls are very useful for large populations of NNIP where herbicide application is impractical or too expensive, but for small populations of NNIP such as in the BWCAW, eradicating or containing the NNIP with herbicides or manual methods is a much more effective route to quickly reducing the impacts of NNIP. Biological controls usually take years to establish, while herbicide and manual methods have a much shorter time frame for successful implementation.

2.4 COMPARISON OF ALTERNATIVES AND EFFECTS

This section provides a summary of the effects of implementing each alternative. Information in Table 6 is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. Chapter 3 provides detailed analysis of potential impacts to resources by alternative.

Table 6. Comparison of Alternatives and Effects

	Alternative 1 – No Action	Alternative 2- Proposed Action	Alternative 3
How well alternative meets purpose and need	Meets purpose and need but not as well as alt. 2 because it results in much more NNIP spread	Meets purpose and need better than other two alts. because it results in the least acres of NNIP spread	Meets purpose and need but not as well as alt. 2 because it results in much more NNIP spread
Known NNIP acres proposed for treatment	14.3 acres	14.3 acres	14.3 acres
Estimate of maximum NNIP spread	600-650 acres	40-60 acres	600-650 acres
Estimate of additional NNIP to treat as new infestations are found	No authority for treating additional infestations	40-60 acres	600-650 acres
Number of treatments required to control small populations	Tap-rooted species: 2-3 Rhizomatous species:	Tap-rooted species: 2-3 Rhizomatous species: 2	Tap-rooted species: 2-3 Rhizomatous species: 3-

	3-5		5
Number of treatments required to control large populations	Tap-rooted species: 3-5 Rhizomatous species: 10	Tap-rooted species: 3-5 Rhizomatous species: 2-4	Tap-rooted species: 3-5 Rhizomatous species: 10
Effects to wilderness character	Greater impact to wilderness character than Alt. 2 or 3: least benefit to natural quality, least impacts to untrammeled and solitude/unconfined qualities	Less impact to wilderness character than Alt. 1 or 3: greatest benefit to natural quality, more impact to untrammeled quality than other Alts., and in between Alts. 1 and 3 for effects to solitude/unconfined quality	Greater impact to wilderness character than Alt. 2 but less than Alt. 1: least impact to untrammeled quality, more impact to solitude/unconfined quality than other Alts., and in between Alts. 1 and 2 for effects to natural quality
Human health risk from herbicide	None	Low	None
Effects to water resources	Very low risk of effects to water quality and aquatic life from treatments; beneficial effects to aquatic habitat from treatments	Low risk of effects to water quality and aquatic life from herbicides; beneficial effects to aquatic habitat (greater than Alt. 1 or 3)	Very low risk of effects to water quality and aquatic life from treatments; beneficial effects to aquatic habitat from treatments
Effects to NNIP	Containing and eradicating known NNIP would take longer with more re-treatments than Alt. 2. Approx. 600-650 ac. of NNIP spread during project implementation, but this alternative can't respond to this changed condition	Containing and eradicating known NNIP would occur faster and with fewer re-treatments than Alt. 1 or 3. Approx. 40-60 ac. of NNIP spread during project implementation	Containing and eradicating known NNIP would take longer with more re-treatments than Alt. 2. Approx. 600-650 ac. of NNIP spread during project implementation
Effects to native plants	A few native plants could be uprooted and killed during manual treatments, and some native plant habitat would be improved, but much less than in Alternatives 2 or 3	A few native plants could be damaged or killed, but in the long term native plant habitat would be improved, more quickly than in Alt. 1 or 3	A few native plants could be uprooted and killed during manual treatments, but in long term native plant habitat would be improved
Effects to TES species	No effect to Canada lynx	No effect to Canada lynx	No effect to Canada lynx
Effects to RFSS species	No impact to most aquatic and terrestrial animals, but 7 animals as well as RFSS plants of disturbed habitats could experience small impacts	No impact to aquatic and most terrestrial animals, but heather vole and RFSS plants of disturbed habitats or rock outcrops/cliffs could experience small impacts	No impact to aquatic or terrestrial animals, but RFSS plants of disturbed habitats or rock outcrops/cliffs could experience small impacts
Effects to wildlife	No impacts to wildlife or wildlife habitat. More wildlife habitat impacted by NNIP spread than	No impacts to wildlife habitat. Low risk of impacts to herbivores from purple loosestrife	No impacts to wildlife or wildlife habitat. More wildlife habitat impacted by NNIP spread than

	Alternative 2 or 3	treatments. Less wildlife habitat impacted by NNIP spread than Alternative 1 or 3	Alternative 2, but less habitat impacted than Alternative 1

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter presents the elements of the environment that could be affected by treatment activities. The "Affected Environment" portion of each section below describes the current condition of the issue indicators and parts of the indicators that could be impacted by the alternatives. The "Environmental Effects" portion of each section below describes the direct, indirect and cumulative effects of the alternatives.

For Alternatives 2 and 3, the interdisciplinary team examined and analyzed data to estimate the effects of each alternative. The data and level of analysis were commensurate with the importance of the possible impacts (40 CFR 1502.15). The effects are quantified where possible, although qualitative discussions may also be included. Much of the analysis for Alternative 1 (No Action) was taken from the 2006 Superior National Forest Non-native Invasive Plant Environmental Assessment (updated as necessary for current resource conditions) and is repeated here to make comparing alternatives easier. For resource areas that were not analyzed in the 2006 Superior National Forest NNIP EA, the Alternative 1 analysis is based on the effects analysis for Alternative 3 which proposes identical treatment methods but at a larger scale.

3.1 WILDERNESS

3.1.1 Introduction

This chapter describes the BWCA Wilderness character that would be affected by the alternatives.

The BWCAW is a natural area located in the northern third of the Superior National Forest in northeastern Minnesota with a contiguous border along Canada's Quetico Provincial Park, also managed as a wilderness area.

Glaciers left behind lakes and streams interspersed with islands that are surrounded by rugged cliffs and crags, gentle hills, canyon walls, rocky shores, and sandy beaches. The total acreage within the BWCAW is 1,098,057. Approximately 1175 lakes varying in size from 10 acres to 10,000 acres and several hundred miles of streams comprise about 190,000 acres (20 percent) of the BWCAW surface area and provide for the opportunity for long distance travel by watercraft. The BWCAW has approximately 80 entry points with access to 1200 miles of canoe routes, 12 hiking trails, and over 2,000 designated campsites. It offers freedom to those who wish to pursue the expansive opportunities for solitude and personal or primitive challenges. In the winter months visitors also enjoy opportunities for skiing, dog-sledding, snowshoeing, camping and ice-fishing. This type of experience is rare within the continental United States and the BWCAW is the only lake land wilderness of its kind and size in the National Wilderness Preservation System allowing visitors to canoe, hike, portage and camp. The BWCAW is one of the most heavily used wilderness areas in the Forest Service with an average of 34,000 reserved permits annually, and over 250,000 visitors a year.

The analysis for the BWCAW considers how the alternatives impact Wilderness Character. Wilderness character may be described as the combination of biophysical, experiential, and

symbolic ideals that distinguishes wilderness from other lands. These ideals combine to form a complex and sometimes subtle set of relationships among the land, its management, and the meanings people associate with wilderness. The accumulated result of seemingly small decisions and actions may cause a significant gain or loss of wilderness character over time (Landres et al. 2008). The primary resource to be analyzed is the character of the wilderness and any impacts created by multiple NNIP treatments.

3.1.2 Analysis Methods

The analysis methods used to measure the effects of this project on the wilderness resource will emphasize the difference between the No Action and Action alternatives. The degree and nature of recreation opportunity and wilderness experience will be compared between alternatives.

The Project Area is NNIP sites scattered throughout the BWCAW. The analysis considers how any of the proposed NNIP management actions would affect wilderness character.

The USDA Forest Service has developed guidelines and methods for wilderness character monitoring. The purpose of monitoring is to provide managers with a tool they can use to answer key questions about wilderness character and stewardship, such as: what is the current state of wilderness character, how is it changing over time, and how do stewardship actions affect and best preserve wilderness character? The guidelines and methods are documented in the General Technical Report "Monitoring Selected Conditions Related to Wilderness Character": a National Framework (Landres et al. 2005). The Wilderness Act of 1964 mandates the Forest Service to preserve wilderness character as a whole, not just maintain four separate qualities of wilderness. Synthesizing this information also yields a more holistic picture that is a more powerful and effective tool for communicating trends of wilderness character to a broad audience, including the public, agency decision-makers and policymakers, and legislators (Gregory and Failing 2003).

The framework defines the four qualities of wilderness as:

Untrammeled - The Wilderness Act states that wilderness "[is] an area where the earth and its community of life are untrammeled by man," and "generally appears to have been affected primarily by the forces of nature." This quality monitors human activities that directly control or manipulate the components or processes of ecological systems inside wilderness. This quality is degraded by actions that manipulate the biophysical environment such as management actions to control NNIP spread. Even though a positive outcome of a management action may outweigh any possible short-term impacts to the untrammeled quality, we must still monitor these actions.

Undeveloped - The Wilderness Act states that wilderness is "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation," "where man himself is a visitor who does not remain" and "with the imprint of man's work substantially unnoticeable." This quality monitors the presence of structures, construction, habitations, and other evidence of modern human presence or occupation. The undeveloped quality of wilderness will not be addressed in this analysis because the proposed activities do not involve these indicators.

Natural - The Wilderness Act states that wilderness is "protected and managed so as to preserve its natural conditions." This quality monitors both intended and unintended effects of modern people on ecological systems inside a wilderness since the area was designated. This quality is degraded by settings that reduce the quality of the physical resources such as the number of extirpated indigenous species, or the number of non-indigenous species present. Paradoxically, introducing a chemical into the environment to manage NNIP can also degrade the physical resources temporarily.

Solitude or a Primitive and Unconfined Type of Recreation - The Wilderness Act states that wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." This quality monitors conditions that affect the opportunity for people to experience solitude or primitive, unconfined recreation in a wilderness setting. Managers and nature provide opportunities; recreational visitors create experiences (Roggenbuck 2004). An indicator of monitoring trends of this quality is remoteness from sights and sounds of people inside wilderness. This quality is degraded by settings that reduce opportunities for solitude or a primitive and unconfined type of recreation, such as too many encounters with other people. Given the complexity of human interactions with their environment and other people, the intent of monitoring this quality is not to understand people's experiences, perceptions, or motivations in wilderness, but instead to focus on the mandate in the Wilderness Act to provide outstanding opportunities and to monitor how these opportunities are changing over time (Landres et al. 2008).

Research on wilderness visitors supports the importance of solitude as a condition or characteristic of wilderness and as an experience achieved, to some degree, by visitors (Dawson 2004). In a 2007 study asking BWCAW visitors the importance of solitude and remoteness, 56 percent of them said it was very important. Different people have different definitions and expectations for opportunities for solitude and those can vary based on many different factors or constraints. The perceptions reported by visitors in surveys and interviews are not easy to interpret for monitoring wilderness conditions as these are considered visitor experiences and not necessarily wilderness conditions; visitor experiences are influenced by a wide variety of intervening psychological, social, experience use history, and environmental factors (Dawson 2004).

The Untrammeled, Natural, and Solitude or Primitive and Unconfined Recreation wilderness character qualities were evaluated for impacts from the project because they directly relate to how the treatments would manipulate the ecological system, affect physical resources and affect opportunities for solitude or primitive and unconfined recreation.

Indicators and Measures

Untrammeled Quality: An indicator for this quality is actions authorized by the Federal land manager that manipulate the biophysical environment. A measure for this indicator is the number of actions to manage plants in the treatment areas. Actions are scrutinized to minimize control or interference with plants, animals, soils, water bodies and natural processes. Actions that intentionally manipulate or control ecological systems inside wilderness can degrade this quality even though they may be taken to restore natural conditions.

Natural Quality: There are two indicators for this quality: 1) Plant species and communities in the treatment areas. The measure for this indicator is the abundance, distribution or number of NNIPs, as well as a change in demography. 2) Biophysical processes. The measure for this indicator is the area and magnitude for pathways for movement of NNIP into the wilderness. The natural quality can be degraded if there are increases in these measures. The untrammeled quality above monitors actions that intentionally manipulate or control, whereas the natural quality monitors the intentional and unintentional effects from actions taken inside wilderness as well as external forces.

Solitude or Primitive and Unconfined Recreation Quality: There are two indicators for this quality: 1) Remoteness from sights and sounds of people inside the wilderness. The measure for this quality is the amount of encounters visitors might have with staff treating weeds at the campsites and portages. A visitor might encounter staff working outside the quota. 2) Temporary management restrictions further confining where visitors may camp. Visitors are already restricted on where they can camp because of designated campsites. The measure for this quality is staff temporarily occupying campsites while treating weeds restricting where visitors can camp. Staff would also occupy a campsite at night camping outside the quota. However, the Forest has staff working outside the quota all season, so this situation would not be unique. It would only cause impact in areas reaching quota capacity.

The meaning of solitude has been at the center of considerable debate among researchers and the public with meanings ranging from a lack of seeing other people, to privacy, to freedom from societal constraints and obligations, to freedom from management regulations (Hall 2001; Hollenhorst and Jones 2001). Unconfined recreation encompasses attributes such as self-discovery, exploration, and freedom from societal or managerial controls (Hendee and Dawson 2002; Lucas 1983). Managers often make difficult decisions about the need for resource protection while also providing outstanding opportunities for solitude and unconfined recreation. Restoring and protecting the native vegetation is one of those decisions.

3.1.3 Analysis Area

The analysis area for direct, indirect and cumulative effects of wilderness for this project will focus on all lands administered by the Superior National Forest within the BWCAW. This area was chosen because in includes both the known sites infested with NNIP as well as other lands where NNIP may spread over the next ten years. Of the 1137 known NNIP occurrences, most occur on campsites (48%), while others occur on portages or trails (26%), along shorelines (13%), at old resort/cabin sites (7%), or in burned areas (6%).

The analysis timeframe for the direct, indirect and cumulative effects analysis is ten years from the time project activities begin, because no effects of project activities will occur until implementation, and because most project activities should be completed within ten years.

3.1.4 Affected Environment

The Forest Plan (page 3-66) Wilderness Management Direction states that the desired future conditions of both the physical and social aspects of the wilderness resource differ slightly between management areas that help describe the treatment sites below. This establishes a framework for managers, along with the wilderness character framework, allowing them to

provide a range of wilderness opportunities for the public while maintaining the overall goals of preservation. The wilderness has been divided into four different MAs (Forest Plan, pages 3-43 through 3-47):

Pristine Wilderness: Areas of pristine wilderness provide outstanding opportunities for isolation, solitude and risk, and are relatively free from the evidence of contemporary human activities. The frequency of encountering others is rare and trails, portages and campsites are not constructed or maintained.

Primitive Wilderness: This area provides excellent opportunities for isolation and solitude, relatively free from the sights and sounds of humans. The frequency of encountering others is low and these areas are generally off the main travel routes providing a high degree of solitude and challenge for those quite capable of traveling in a pristine area. Area contains maintained trails, portages and campsites.

Semi-primitive Non-motorized Wilderness: Opportunities for experiencing isolation and solitude are moderate to low as these areas are generally on main travel routes. The frequency of encountering others in the area is moderate. The challenge and risk in these areas is moderate to low. Area contains maintained trails, portages and campsites.

Semi-primitive Motorized Wilderness: Opportunities for experiencing solitude and isolation are low. Motorized watercrafts are permitted and will be noticeable along major travel routes and portages and near major entry points. The frequency of encountering others is moderate to high. Area contains maintained trails, portages and campsites.

The following identifies the number of sites and acreage of treatment areas within each MA.

Wilderness Management Area	Treatment areas
Pristine Wilderness	0 NNIP sites, 0 acres
Primitive Wilderness	293 NNIP sites, 1.6 acres
Semi-Primitive Non-Motorized Wilderness	540 NNIP sites, 8.1 acres
Semi-Primitive Motorized Wilderness	304 NNIP sites, 4.6 acres

3.1.5 Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Untrammeled Quality of Wilderness Character:

For the no action alternative, the types of effects to the untrammeled quality from proposed treatments are identical to the effects described in detail below for Alternative 3 since both alternatives propose identical manual treatment methods. Both Alternatives 1 and 3 propose one type of action, manual treatments, which would cause adverse impacts to the untrammeled quality, unlike Alternative 2 which proposes two types of actions, manual and herbicide treatments. For this reason, the magnitude of effects of Alternatives 1 and 3 to the untrammeled quality would be the same. Please see the effects analysis below for Alternative 3 for more detailed discussion on how manual treatments would trammel the wilderness.

Undeveloped Quality of Wilderness Character:
Alternative 1 would have no effect on the undeveloped quality of wilderness character.

Natural Quality of Wilderness Character:
For the no action alternative, the types of effects to the natural quality from proposed treatments are identical to the effects described in detail below for Alternative 3 since both alternatives propose identical manual treatment methods. However, the magnitude of effects would be much different under Alternative 1 since fewer acres of treatment are proposed. Fewer acres of handpulling treatments translate into a much larger amount of NNIP spread and subsequent adverse impacts native plant communities and the natural quality of wilderness character. Alternative 1 would have much less benefit on the natural quality than either Alternative 2 or 3. Please see the effects analysis below for Alternative 3 for more detailed discussion on how manual treatments would affect the natural quality of wilderness character.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation Quality of Wilderness Character:
For the no action alternative, the types of effects to the outstanding opportunities for solitude or unconfined type of recreation from proposed treatments are identical to the effects described in detail below for Alternative 3 since both alternatives propose identical manual treatment methods. However, the magnitude of effects would be different under Alternative 1 since fewer acres of treatment are proposed. Fewer acres of handpulling treatments translate into lower numbers of encounters between treatment crews and visitors and more opportunities for solitude and a primitive and unconfined type of recreation. Alternative 1 would have less adverse impacts to this quality than either Alternative 2 or 3. Please see the effects analysis below for Alternative 3 for more detailed discussion on how manual treatments would affect the outstanding opportunities for solitude or unconfined type of recreation quality of wilderness character.

Alternative 2 – Proposed Action
Untrammeled Quality of Wilderness Character:
An increasing amount of manipulative actions by management can adversely affect the untrammeled quality. Treating NNIP with herbicides and hand-pulling could affect the untrammeled quality of wilderness because both actions are human control and manipulation of the wilderness resource. Alternative 2 would adversely impact the untrammeled quality more than Alternative 1 or 3 because it involves two controlling actions instead of just one with hand-pulling alone. The addition of herbicides to Alternative 2 would mean that ecological systems in the BWCAW are being manipulated beyond the physical control of hand-pulling. Alternative 2 would cause more trammeling to the BWCAW than Alternative 1 or 3.

Undeveloped Quality of Wilderness Character:
Alternative 2 would have no effect on the undeveloped quality of wilderness character.

Natural Quality of Wilderness Character:
Impacts to native plants, wildlife, and water resources in the wilderness are disclosed in Chapter 3 of this EIS; this analysis for the natural quality considers these sections as applicable to wilderness character.

The natural quality can be adversely impacted if the abundance, area occupied, or number of invasive non-indigenous species increases, or the magnitude of pathways for the movement of NNIP increases. However, as mentioned above, we evaluate effects to wilderness character as a whole. One quality may slightly suffer in the short term due to effects, another quality may drastically improve due to those same effects, and wilderness character as a whole may improve. The untrammeled quality above monitors actions that intentionally manipulate or control, whereas the natural quality monitors the intentional and unintentional effects from actions taken inside wilderness, and at times from outside wilderness. Under Alternative 2, herbicides and manual treatment methods would be used to benefit the natural quality of wilderness character. Effective NNIP treatment would enhance the natural quality by restoring native vegetation and reducing the influence of non-native invasive plants on all components of the wilderness resource. Herbicide use, combined with selective hand-pulling of tap-rooted NNIP (which effectively kills them), would offer a high level of control of invasive plants, and eradication of small NNIP infestations would be possible, with a subsequent high restoration of the "natural" quality of wilderness relative to Alternative 1 and 3.

The use of herbicides introduces a chemical into the natural environment and is an adverse effect on the "natural" quality. However, as shown in Table 3 in Chapter 1.6.1, the quantities of herbicide proposed for use annually would be small (i.e. less than one gallon of herbicide concentrate annually). While there would be short term impacts to the natural quality from herbicide use, over the long term the benefits of herbicide use in containing and eradicating NNIP would outweigh these short term impacts. In the long run, Alternative 2 would have a much greater benefit to the natural quality of wilderness character than either Alternative 1 or 3.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation Quality of Wilderness Character:
The outstanding opportunities for solitude or unconfined type of recreation can be adversely affected if the number of crew encounters by visitors increases. First, treatment crews will be seen by visitors in three of the four management areas and will not be part of the quota. So, it's possible that when they are in an area meeting capacity, the crews could camp at a needed site or increase visitor encounters, and therefore impact the opportunity for solitude. As mentioned above, mitigation for site occupancy is possible as Forest Service crews do on occasion leave-no-trace camp off site and out of sight when designated campsites are full of visitors, so their camping presence may not have a big impact on visitors. However, this impact would be lower under Alternative 2 compared to Alternative 3, since herbicide use would offer quicker control of NNIP infestations and thus entail fewer visits to the sites by crews than Alternative 3. Fewer visits to NNIP sites in the BWCAW would mean less impact to the solitude portion of this wilderness quality. Alternative 1 would have the least potential for encounters and the least impact to this wilderness quality.

Second, treatment crews could temporarily occupy a site during hand-pulling and prevent visitor use during the treatment period. This could temporarily restrict visitor use of the site and the area in general, and therefore impact the opportunity for unconfined recreation due to more restrictions. This effect would be slightly greater for Alternative 2 compared to Alternative 1 or 3 concerning campsites because crews would remain on site after treatment while waiting for the

herbicide to dry. However, Alternative 3 with hand-pulling alone could incur more site visits by the treatment crews to control NNIP into the future.

Under Alternative 2, we would be using all the tools at our disposal for NNIP management, which would effectively contain and eradicate NNIP.

Alternative 3

Untrammeled Quality of Wilderness Character:

An increasing amount of manipulative actions by management can adversely affect the untrammeled quality. Manual treatments of crews pulling of NNIP could reduce this quality because treatments are intentional actions manipulating or controlling ecological systems, even though the target plants are not native and the results improve the Natural quality. The use of manual methods alone would represent less trammeling than using both herbicides and hand-pulling because adding herbicides as a treatment would be another controlling action. Overall, Alternative 3 would cause less trammeling to the BWCAW than Alternative 2 because hand-pulling is only one management action; Alternative 3 would cause the same amount of trammeling as Alternative 1 because both alternatives propose just one manipulative action, handpulling. However, we weigh effects to individual qualities against effects to wilderness character as a whole. No action now could cause negative effects to more qualities in the future. See Table 7.

Undeveloped Quality of Wilderness Character:

Alternative 3 would have no effect on the undeveloped quality of wilderness character.

Natural Quality of Wilderness Character:

The natural quality can be adversely affected if the abundance, area occupied, or number of invasive non-indigenous species increases, or the magnitude of pathways for the movement of NNIP increases. However, as mentioned above, we evaluate effects to wilderness character as a whole. One quality may slightly suffer in the short term due to effects, another quality may drastically improve due to those same effects, and wilderness character as a whole may improve. The untrammeled quality above monitors actions that intentionally manipulate or control, whereas the natural quality monitors the intentional and unintentional effects from actions taken inside wilderness, and at times from outside wilderness. Using manual treatments to control NNIP would benefit the natural quality of wilderness character. The composition, structure, and function of natural communities would be enhanced by removing NNIP. Native vegetation and native plant and animal habitat would be restored. Non-native invasive plants can cause changes to vegetation, and these changes can in turn adversely impact fish and wildlife habitat. However, hand pulling is not an effective treatment for most NNIP in the BWCAW. Hand pulling would only offer moderate control, since most roots would continue to remain in the soil after pulling, and these roots would continue to grow and spread vegetatively. Over the long term, hand pulling can disturb soil and enhance the germination of weed seeds. For these reasons, much more weed spread would occur during project implementation of Alternative 3 compared to Alternative 2 (see Section 3.4.5 for further discussion). While Alternative 3 would benefit the natural quality of wilderness character, the benefits would be substantially less than Alternative 2. Both Alternatives 2 and 3 would benefit the natural quality much more than Alternative 1.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation Quality of Wilderness Character:
The outstanding opportunities for solitude or unconfined type of recreation can be adversely impacted if the number of encounters by visitors increases due to treatment crews working outside the quota. First, treatment crews will be seen by visitors in three of the four management areas and will not be part of the quota. So, it's possible that when they are in an area meeting capacity, the crews could camp at a needed site or increase visitor encounters, and therefore impact the opportunity for solitude. This effect would be considerably greater for Alternative 3 than Alternative 2 or Alternative 1 because more site visits by the treatment crews would be required to control NNIP using hand pulling alone. However, mitigation for this effect is possible for both alternatives as Forest Service crews do on occasion leave-no-trace camp off site and out of sight when designated campsites are full of visitors, so their camping presence may not have a big impact on visitors.

Second, treatment crews could temporarily occupy a site during hand-pulling and prevent visitor use during the treatment period. This could temporarily restrict visitor use of the site and the area in general, and therefore impact the opportunity for unconfined recreation due to more restrictions.

Table 7. Comparison and Summary of Impacts to Wilderness Character

	Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 3
Untrammeled	+++++-----	+++-------	+++++-----
Undeveloped	NA	NA	NA
Natural	++--------	+++++++++-	++++++----
Solitude or Unconfined Recreation	++++++----	+++++-----	++++------
SUMMARY	**13+/17-**	**17+/13-**	**15+/15-**

Note: This table summarizes the effects analysis for wilderness character from the preceding pages. + indicates a benefit to a wilderness character quality and – indicates a negative impact to a wilderness character quality. For example, the table indicates that for the solitude or unconfined recreation quality, Alternative 1 would have a greater benefit to this quality of wilderness character (6 +'s) than Alternative 2 (5+'s), and both would have a greater benefit to this quality than Alternative 3 (4+'s). An earlier version of this table appeared in the Minimum Requirements Decision Guide (MRDG – Appendix E) for this project – please see the MRDG for more details.

Conclusion
Refer to table 7. All alternatives would impact wilderness character to some degree. In the short term, the negative impact to the untrammeled quality under Alternative 2 would be greater than the negative impact to this quality under Alternative 1 or 3. Alternative 2 would have a greater benefit to the natural quality than Alternative 3, and both would have greater benefit to the natural quality than Alternative 1. Opportunities for solitude or unconfined type of recreation would be least impacted by Alternative 1, followed by Alternative 2 then Alternative 3.

Overall, Alternative 2 has the greatest benefit to wilderness character, followed by Alternative 3 then Alternative 1. Alternative 2 has limited negative short term impacts to some wilderness

character qualities, but very strong long term benefits to the natural quality of wilderness character, and therefore Alternative 2 would do the most to preserve wilderness character. Project design elements (e.g. low toxicity herbicides, spot application) that limit the negative impacts of herbicides combined with OSG's that attempt to minimize effects to wilderness character (e.g. timing treatments with lower visitor use) would limit impacts of the project to wilderness character. The No Action Alternative would have the most negative effects on preserving wilderness character.

Cumulative Effects

Untrammeled: What actions manipulate or control ecological systems inside the BWCAW and are they changing over time? There are on-going Forest Service project actions in the wilderness that may manipulate aspects of the ecological system, including discretionary and non-discretionary (upholding laws) actions because we and other agencies manage plants, animals, pathogens, soil, water, fire, etc. inside wilderness. All of these actions can affect the untrammeled quality even though they are necessary to maintain the area for visitor use and prevent further damage to the natural resources.

The current projects on the Forest involve fuels reduction (2001 BWCAW Fuel Treatment EIS), management of wildland fires (Alpine Lake, Turtle, Cavity Lake, Famine/Redeye, Ham Lake and Pagami Creek fires), cultural resources (on-going heritage site surveys), recreation (Curtain Falls portage reroute, Slim Lake campsite construction, Dent Lake campsite relocation, Fishhook Lake campsite construction, and annual maintenance), and Department of Natural Resource projects (fish stocking and surveys, animal tracking, etc.)

This concept of trammeling applies to all manipulations since the time of wilderness designation, but does not apply to manipulations that occurred prior to the designation. Wilderness legislation directs us to scrutinize our actions and minimize control, however, the BWCAW is one of the most heavily used wilderness areas in the Nation and the effects from that high use are somewhat off-set by management mitigation actions. The intent is to allow as few manipulative actions as possible to protect the natural resources while providing opportunities for public use, enjoyment and understanding of the wilderness. As an agency, we authorize and monitor those actions choosing to impact the untrammeled quality for long term benefit. It is a balancing act. The decisions to implement these projects can adversely impact the untrammeled quality even though these decisions may lead to restoration of an area or other well-meaning purposes benefiting other aspects of wilderness character because we are manipulating the wilderness environment. However, this NNIP project decision will result in cumulative beneficial effects to the natural aspect of wilderness character (see below)

The cumulative actions most relevant to adverse cumulative impacts to the untrammeled quality are the ongoing work by Forest Service crews to clear portages and maintain campsites. This is because management actions to control NNIP in this project would be concentrated where NNIP are present, which is also where the ongoing maintenance occurs (i.e. portages and campsites). The cumulative adverse impact may be an increase in manipulative actions in these areas when NNIP management actions are added to the ongoing maintenance actions.

Natural: How are the biological and physical resources in terrestrial, aquatic, and atmospheric environments fairing in the BWCAW and are they changing over time? As mentioned above, there are on-going Forest Service projects in the wilderness that may affect aspects of the ecological system, as well as projects outside wilderness that may affect wilderness character. The untrammeled quality monitors those authorized actions, whereas the natural quality monitors the *effects* from those actions. The current projects inside the wilderness for fuels reduction, wildland fire management, cultural resource projects, recreation, and State fish and wildlife projects can have an effect on the biological and physical aspects of wilderness (see specific projects above in the Untrammeled section).

All ecological systems change over time and vary from one place to another, and monitoring this quality is not intended to maintain static natural conditions (Landres et al. 2008). Trends in the various indicators should only be considered "red flags" that may suggest a need for research or more intensive monitoring to verify change and understand the cause (Landres et al. 2008). We also monitor current projects on the Forest outside the wilderness that could impact the natural quality of wilderness. For this situation, we look at area and magnitude for pathways for movement of NNIP into the wilderness. Current projects involve vegetation management (Border EIS, Echo Trail EIS, Glacier EIS, Twins EA, Toohey EA and Birch EA), minerals projects (Federal Hardrock Mineral Prospecting Permit EIS) and radio towers (MNDOT ARMER Project). See Appendix J for cumulative actions. NNIP management inside wilderness reduces cumulative adverse effects by helping to prevent NNIP spread to disturbed areas outside wilderness and can reduce the cumulative adverse impact of any NNIP that spread into the wilderness from outside the boundary due to these projects.

Over the last ten years, the Forest has been implementing an integrated pest management (IPM) program to combat non-native invasive species. This approach includes information and education, inventory and early detection, prevention, treatments, restoration, monitoring, and partnerships and coordination. Monitoring the effects from NNIP management will continue annually. The effects from this NNIP project and effects from other projects on the ecological systems inside wilderness is part of the overall trends monitoring in terrestrial, aquatic and atmospheric natural resources in the BWCAW. The decision to treat NNIP in conjunction with these on-going projects would only prevent further NNIP spread. For example, some NNIPs spread more quickly after a fire. If the burn area doesn't contain NNIP due to treatments suggested in this document, there wouldn't be a cumulative effect. Another example is recreation projects as some NNIPs spread more quickly after ground disturbing projects like portage re-routes. Again, if the project area doesn't contain NNIPs, there wouldn't be a cumulative effect from NNIP spread. This project will benefit the natural quality when effects of other projects in the area are considered.

Solitude or Primitive and Unconfined Recreation: What is the trend in opportunities for remoteness from sights and sounds of other people? The current projects of fuels reduction, wildland fire management, cultural resource projects, recreation, and State projects can have an effect on solitude as they may involve employees working inside the BWCAW throughout the year. We may also monitor effects to this quality from current projects on the Forest outside the wilderness as well. Current projects involving vegetation management, as mentioned in the natural section, may contribute to the area of wilderness affected by access or travel routes that

are adjacent to the wilderness, night sky visibility, and intrusions on the natural soundscape. In general, visitors will possibly see and hear employees involved in other projects along with the NNIP crew, and their opportunities for solitude may be diminished at certain times of the day in certain locations. However, visitors also make purposeful contact with wilderness rangers due to our mandatory quota system and permit validation in the field, and are used to seeing Forest Service employees in the wilderness. In the BWCAW, unlike many other wilderness areas, visitors often say they wish they could see more wilderness rangers. With the size of the wilderness and the many and varied routes into different areas, the BWCAW is able to absorb dispersed use fairly well and crews will be able to blend as do the visitors. Visitors are also accustomed to hearing noise from projects outside wilderness. NNIP crews will be a minor addition to the current project noise and crews affecting the wilderness.

What is the trend in opportunities for unconfined recreation? Visitors are already restricted on where they can camp because of designated campsites and various area closures due to fire damage or restored sites. NNIP staff may temporarily occupy campsites while treating weeds restricting where visitors can camp. Staff may also occupy a campsite at night camping outside the quota further restricting where visitors can camp. Forest staff associated with several other projects working outside the seasonal quota, and occupying sites and locations due to project work and treatments may compound the issue depending on the area and if it neared quota capacity. Visitors may be forced to travel further than they anticipated. However, staff tries to balance these work trips throughout the season and visitor travel in wilderness comes with a certain amount of risk and challenge. Visitor opportunities for unconfined recreation may be diminished even further at certain times of the day in certain locations from other project crews occupying campsites. However as mentioned above, mitigation for this effect is possible for all alternatives as Forest Service crews do on occasion leave-no-trace camp off site and out of sight when designated campsites are full of visitors, so their camping presence may not have a big impact on visitors. In the long run, the effects from extra NNIP crews working in the field will improve the natural quality with only short-term possible negative effects to this quality.

3.2 HUMAN HEALTH

3.2.1 Introduction

During project scoping, the public raised concerns that visitors recreating in the BWCAW could be exposed to herbicides in the environment and experience health impacts. This section examines this potential effect and describes the risk of public health impacts likely to be caused by this project.

3.2.2. Analysis Methods

The analysis below compares the proposed use of herbicides in this project to the outcomes of Forest Service herbicide risk analyses. The USDA Forest Service contracted with Syracuse Environmental Research Associates (SERA) to evaluate toxicological data and human health effects based on Environmental Protection Agency (EPA) studies and other current peer-reviewed scientific literature. Analysis of human health risks from the proposed use of herbicides is based on SERA Human Health and Ecological Risk Assessments (RAs), their associated worksheets, and other documents. The SERA RAs and worksheets are incorporated into this analysis and can be found at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

SERA's risk assessments quantitatively characterize the risks for all four herbicides proposed for use in this project (RAs: metsulfuron methyl - SERA 2004; imazapic - SERA 2004; aminopyralid - SERA 2007a; triclopyr - SERA 2011a; worksheets: metsulfuron methyl – SERA 2006; imazapic – SERA 2006; aminopyralid – SERA 2007b; triclopyr – SERA 2011b and SERA 2011c). The RAs quantify hazards posed by the herbicides, quantitatively estimate public exposure to herbicide, and describe a dose-response relationship to come up with the risk of the herbicide to the public.

The toxicities of the four herbicides proposed for use are presented in detail in Appendix D. During the herbicide registration process, the EPA evaluated all of these herbicides for their acute and chronic toxicity, carcinogenicity, effects on the reproductive, nervous, immune, and endocrine systems, and skin and eye sensitization. Judgments about the potential hazards of herbicides to humans are based, in large part, on the results of toxicity tests on laboratory animals. Detailed toxicological analysis and literature review for each herbicide are found in the SERA RAs. Triclopyr, imazapic, aminopyralid, and metsulfuron methyl are all low toxicity herbicides that have been used safely on the Superior National Forest for the last five years.

As part of each risk assessment, a set of general exposure scenarios was developed based on the normal use of the herbicides. These scenarios include: accidental direct spray of a child or woman, walking through a sprayed area shortly after treatment, drinking water from a sprayed watershed, drinking water from a pond in which herbicide has been accidentally spilled, swimming in water with herbicide run-off, and eating sprayed fruit, vegetation, or fish. These scenarios are very conservative, and many of their assumptions model a worst-case scenario. Some of them model short-term (acute) effects, and others model long-term (chronic) effects.

The EPA has developed Reference Doses (RfDs) to serve as a threshold for estimating the risk of health effects from either a lifetime of exposure to herbicides or a one-time exposure. These RfDs generally reflect the most conservative (i.e. health protecting) No Observed Adverse Effect Level (NOAEL –this is the highest level of herbicide exposure at which no adverse effects are observed) and are made even more conservative by the application of a safety factor of 100. The safety factor accounts for data uncertainty and other factors representing corrections for both intra- and inter-species variability. The RAs for these four herbicides compared the outcomes of the exposure scenarios to the EPA's RfD to evaluate whether the public exposure scenarios could potentially exceed the reference dose.

The RAs combine three factors: the herbicides' inherent hazard, an estimate of exposure, and a dose-response assessment. Together, these generate an estimate of risk for each scenario for each chemical – referred to as the Hazard Quotient (HQ). The HQ is the ratio between the estimated dose (the amount of herbicide received from a particular exposure scenario) and the RfD. When a scenario has a dose less than the RfD, then the HQ is less than 1.0, and health effects are unlikely for that specific scenario. The herbicides proposed for use in this project are compared in the effects analysis based on their HQ calculated in the pertinent RA.

3.2.3 Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest within the project area for the BWCAW NNIP Management

Project. This area was selected because this is where project activities will occur which cause the direct and indirect effects. The area covered by the cumulative effects analysis includes lands of all ownerships within the project area for the BWCAW NNIP Management Project. This cumulative effects analysis area was selected because non-federal lands within project area boundaries share a number of physical characteristics (e.g. soils, landforms, etc.) with adjacent National Forest lands. NNIP that occur on these adjacent lands may be treated by this project. Because treatments may occur on these lands and because they are intermingled with federal lands in the project area, the BWCAW NNIP Management Project boundary makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities will occur until implementation, and because most project activities should be completed within ten years.

3.2.4 Affected Environment

The analysis area has approximately 14.3 acres of NNIP that are scattered over 1137 locations. Of the 1137 known occurrences, most are found on campsites (48%), while others occur on portages or trails (26%), along shorelines (13%), at old resort/cabin sites (7%), or in burned areas (6%). In most cases, the NNIP occur where there is continuing or past human influence. Most treatments would take place at locations where visitors could be present at some point of the year.

The BWCAW draws over 250,000 visitors per year with peak visitation in late summer. Visitor use concentrates at entry points, campsites, and portages. Human populations that may be affected by NNIP control actions include recreationists passing through or camping at treated areas, visitors picking blueberries, anglers, swimmers, and others.

3.2.5 Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Although the effects of manual treatments to human health were not analyzed in the 2006 Superior National Forest Non-Native Invasive Plant Management Environmental Assessment, the proposed treatment methods under Alternative 1 are the same as for Alternative 3, and the effects would be very similar. Under the no action alternative, manual methods of NNIP treatment would be used to eradicate and contain NNIP infestations. Digging, pulling, or cutting NNIP would generally have no effects on the health of BWCAW visitors. Hazards visitors could be exposed to include: tripping hazards from NNIP branches or stems left at campsites or portages, sharp edges on tools used by crews, or hornets inadvertently stirred up by treatment activities. However, crews would be following established safety guidelines to prevent such hazards, and any treatments taking place at a site where visitors are present would involve a public contact to inform the public of the activities and hazards. The potential for health impacts from Alternative 1 are extremely low.

Alternative 2 – Proposed Action

For three of the proposed herbicides (aminopyralid, imazapic, and metsulfuron methyl), no route of exposure or scenario suggests that visitors' health would be at risk from either longer-term or

shorter-term exposure to these herbicides. For all three of these herbicides, the hazard quotient is below 1.0 for all of the exposure scenarios (SERA 2004, SERA 2004, SERA 2007a).

Two types of triclopyr would be used in this project. Most of the triclopyr used would be an aquatic-labeled triclopyr for treating purple loosestrife, while a small amount would be a terrestrial-labeled triclopyr used for treating either Siberian peabush (1 site, 0.0002 ac) or tatarian honeysuckle (6 sites, 0.02 ac). For aquatic-labeled triclopyr, one exposure scenario exceeds the hazard quotient of 1.0: a child drinking water from a ¼ acre pond that is 1 meter deep into which 200 gallons of herbicide mix is spilled. For terrestrial-labeled triclopyr, several exposure scenarios exceed the hazard quotient of 1.0: the child-contaminated pond scenario, a woman consuming contaminated fruit (both short-term and long-term exposure), and a woman consuming contaminated vegetation (both short-term and long-term exposure). The hazard quotients for these scenarios range from 2 to 27 (SERA 2011a).

The child drinking water from a triclopyr-contaminated pond scenario would be very implausible under the BWCAW NNIP Management Project. The maximum amount of triclopyr that a crew would have on a trip to treat purple loosestrife would be the concentrated equivalent of 10 gallons of herbicide mix, much less than the 200 gallons in the scenario. Furthermore, any such accidental spill would trigger actions that would prevent anyone from drinking out of the waterbody (see Appendix F – Herbicide spill response plan). Lastly, operational standards and guidelines (OSGs – see Appendix B) would greatly reduce the risk that any such spill would happen in the first place. For example, transporting herbicides in their original container which would be inside a second watertight container, or using a catch basin that is at least 50 feet away from water for all mixing operations, would provide a margin of safety that would prevent accidental spills and impacts to human health.

The other scenarios that suggest potential risk to visitors are those involving consuming fruit or vegetation that has been sprayed with terrestrial-labeled triclopyr (SERA 2011a). Currently, there are only six sites (0.02 acres) where either Siberian peabush or tatarian honeysuckle are proposed to be treated with terrestrial-labeled triclopyr. These treatments would involve cutting the shrub and dabbing the freshly cut stump with herbicide to kill the plant; they are not a foliar application where the herbicide is applied to the leaves. There would be little risk of triclopyr getting on non-target fruit like blueberries or vegetation that people might eat. More importantly, treated areas would be posted and any plants that had come into contact with triclopyr would look wilted or dead, making them unlikely targets for berry pickers. These factors mitigate the risk of these scenarios to human health.

There is a virtually no risk that there would be any human exposure to aquatic-labeled triclopyr via wild rice consumption. First, there are no wild rice stands near any purple loosestrife proposed for treatment. Rather, there are only scattered wild rice plants, and ricers generally only harvest rice where there is enough rice to make harvesting it worth the effort. Second, herbicide would be applied to the purple loosestrife via a wipe-on foliar application, and this would take place only if there is no standing water around the purple loosestrife (pulling would occur if there is standing water). This eliminates the risk of herbicide drift and the risk that herbicide would reach the wild rice via surface water. For these reasons, the risk of human exposure to aquatic-labeled triclopyr is extremely low.

In spite of the fact that most of the scenarios do not indicate any plausible risk to human health from herbicide use proposed by this project, this project is still designed to reduce the risk of exposure to visitors to an absolute minimum. The project was designed to have low risk to human health, from the choice of using low toxicity herbicides to the use of spot application methods that greatly reduce the amount of herbicide that misses its target. OSGs were designed to greatly limit public exposure to herbicide. The OSGs (Appendix B) include measures that time applications to periods of lower public use, that specify posting signs at treated sites, or that instruct applicators to wait at sites until the herbicide dries. OSGs greatly reduce chances for public exposure and subsequent health risks from the proposed herbicides.

Alternative 3

Under Alternative 3, manual methods of NNIP treatment would be used to eradicate and contain NNIP infestations. Digging, pulling, or cutting NNIP would generally have no effects on the health of BWCAW visitors. Hazards visitors could be exposed to include: tripping hazards from NNIP branches or stems left at campsites or portages, sharp edges on tools used by crews, or hornets inadvertently stirred up by treatment activities. However, crews would be following established safety guidelines to prevent such hazards, and any treatments taking place at a site where visitors are present would involve a public contact to inform the public of the activities and hazards. The potential for health impacts from Alternative 3 are extremely low.

Conclusion

Alternatives 1 and 3 would have extremely low risks to human health. Safety practices would prevent impacts to the public from treating NNIP with manual methods. The use of herbicides for NNIP treatments in Alternative 2 would have a low risk of impacts to human health. The use of low toxicity herbicides, the low number of acres proposed for treatment, project design, and OSGs would all limit the risk of this alternative to human health.

Cumulative Effects

Because Alternatives 1 and 3 would have essentially no effects to human health, these alternatives would also have no cumulative effects to human health.

There is low potential for the risk of cumulative effects to human health from the use of herbicides proposed in Alternative 2. Cumulative effects could arise from repeated doses of herbicide, such as if an individual repeatedly (e.g. over an entire summer) consumed fish or water from a watershed where herbicides were used to treat NNIP, or was exposed to herbicides at a BWCAW entry point that had been treated with herbicides under the 2006 Superior National Forest NNIP Management Project in addition to those proposed for use in the BWCAW.

Forest Service risk assessments consider the effects of both single (acute) and repeated or chronic exposures (defined by EPA as daily doses over a 70 year lifespan) by assessing the exposure levels for each herbicide. Chronic long-term exposure scenarios are based on a lifetime of repeated doses from consuming contaminated water, fruit, vegetation, or fish.

This analysis specifically considers the effect of repeated exposure in the chronic exposure scenarios and through the use of the chronic RfD as an index of acceptable exposure. Where

individuals could be exposed by more than one route, the cumulative risk of such cases can be quantitatively characterized by adding the HQs for each exposure scenario. Using aminopyralid as an example, the typical levels of exposure for a woman repeatedly consuming contaminated fruit and vegetation leads to a combined HQ of 0.0054. For all of the chronic aminopyralid exposure scenarios, the addition of all possible pathways lead to HQs that are two orders of magnitude less than 1, indicating an acceptable level of cumulative risk (SERA 2007b). Consequently, repeated exposure to levels below the toxic threshold should not be associated with cumulative toxic effects.

Similar scenarios can be developed with the other herbicides. Imazapic, metsulfuron methyl, and triclopyr persist in the environment for a relatively short time (soil half-lives of 180 days or less; Appendix D), do not bioaccumulate in humans, and are rapidly eliminated from the human body. For imazapic and metsulfuron methyl, no cumulative health effects from repeated exposures in the past, present or foreseeable future are predicted. For terrestrial-labeled triclopyr, chronic exposure through repeated consumption of contaminated fruit or vegetation leads to HQ greater than one. As discussed above under Direct and Indirect effects, there is little plausible risk to human health from these exposure pathways for triclopyr, and no cumulative effects are expected.

3.3 WATER RESOURCES

3.3.1 Introduction

During project scoping, the public raised concerns that herbicides used in the project could affect water resources found in the project area. This section examines this potential effect and describes the risk of impacts to Outstanding Resource Value Waters, water quality, and aquatic life.

3.3.2 Analysis Methods

The analysis below compares the proposed use of herbicides in this project to the outcomes of Forest Service herbicide risk analyses. The USDA Forest Service contracted with Syracuse Environmental Research Associates (SERA) to evaluate ecological and toxicological data based on Environmental Protection Agency (EPA) studies and other current peer-reviewed scientific literature. Analysis of the risks to aquatic resources from the proposed use of herbicides is based on SERA Human Health and Ecological Risk Assessments (RAs), their associated worksheets, and other documents. The SERA RAs and worksheets are incorporated into this analysis and can be found at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

SERA's risk assessments quantitatively characterize the risks for all four herbicides proposed for use in this project (RAs: metsulfuron methyl - SERA 2004; imazapic - SERA 2004; aminopyralid - SERA 2007a; triclopyr - SERA 2011a; worksheets: metsulfuron methyl – SERA 2006; imazapic – SERA 2006; aminopyralid – SERA 2007b; triclopyr – SERA 2011b and SERA 2011c). The RAs quantify hazards posed by the herbicides, quantitatively estimate aquatic resources exposure to herbicide, and describe a dose-response relationship to come up with the ecological risk of the herbicide to aquatic resources.

The toxicities of the four herbicides proposed for use are presented in detail in Appendix D. During the herbicide registration process, the EPA evaluated the toxicity of all of these

herbicides on aquatic life. Judgments about the potential hazards of herbicides to aquatic life are based, in large part, on the results of standard acute and chronic bioassays on fish, aquatic invertebrates, and in some cases amphibians. Detailed toxicological analysis and literature review for each herbicide are found in the SERA RAs. Triclopyr, imazapic, aminopyralid, and metsulfuron methyl are all low toxicity herbicides that have been used safely on the Superior National Forest for the last five years.

As part of each risk assessment, a set of general exposure scenarios was developed based on the normal use of the herbicides. These scenarios include: accidental spill in a pond, accidental spray/drift/leaching into a pond, and accidental spray/drift/leaching into a stream. These scenarios are very conservative, and many of their assumptions model a worst-case scenario. Some of them model short-term (acute) effects, and others model long-term (chronic) effects.

During the herbicide registration process, toxicological studies are conducted on a variety of species. Generally these studies are used to develop the No Observed Adverse Effect Level (NOAEL – this is the highest level of herbicide at which no adverse effects are observed). The NOAELs are generally very conservative (i.e. health protecting) and are made even more conservative by the application of a safety factor of 100. The safety factor accounts for data uncertainty and other factors representing corrections for both intra- and inter-species variability. The RAs for these four herbicides generally compare the outcomes of the exposure scenarios to the NOAEL to evaluate whether the exposure scenarios for aquatic life could potentially exceed the dose at which adverse effects begin to be observed.

The RAs combine three factors: the herbicides' inherent hazard, an estimate of exposure, and a dose-response assessment. Together, these generate an estimate of risk for each scenario for each chemical – referred to as the Hazard Quotient (HQ). The HQ is the ratio between the estimated dose (the amount of herbicide received from a particular exposure scenario) and the dose at which no adverse effect is observed. When a scenario has a dose less than the NOAEL dose, then the HQ is less than 1.0, and toxic effects are unlikely for that specific scenario. The herbicides proposed for use in this project are compared in the effects analysis based on their HQ calculated in the pertinent RA.

3.3.3 Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest within the three sixth level (12 digit) HUC watersheds that intersect the project area for the BWCAW NNIP Management Project. This area was selected because this is where project activities will occur which cause the direct and indirect effects. The area covered by the cumulative effects analysis includes lands of all ownerships within the three sixth level (12 digit) HUC watersheds that intersect the project area for this Project. This cumulative effects analysis area was selected because non-federal lands within project area boundaries share a number of physical characteristics (e.g. soils, landforms, etc.) with adjacent Forest Service lands. NNIP that occur on these adjacent lands may be treated by this project. Because treatments may occur on these lands and because they are intermingled with federal lands in the project area, this analysis area makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities will occur until implementation, and because most project activities should be completed within ten years.

3.3.4 Affected Environment

The project area is located in three subbasins: Rainy River Headwaters and the Vermilion River, both of which flow into the Rainy River-Rainy Lake subbasin, and Lake Superior North, which flows into Lake Superior. The Rainy River Headwaters drains approximately 1,607,846 acres, with approximately 879,375 acres in the project area. The Vermilion River drainage encompasses 661,296 acres, with approximately 44,908 acres in the project area. The Lake Superior North subbasin covers a total area of 1,015,865 acres, with approximately 172,007 acres located in the project area.

The project area contains a broad array of aquatic habitats, from deep, cold oligotrophic lakes to rich, highly productive mesotrophic lakes, to small shallow tannic-stained beaver ponds, and from small creeks to moderate sized rivers like the Kawishiwi River. The project area provides habitat for cold-water species like lake trout and cisco as well as warm water species like bluegill, smallmouth bass, and walleye. The project area has suitable habitat for nine RFSS aquatic species; these are addressed in the Biological Evaluation and the section on RFSS species.

In general, the water bodies in the project area have very high water quality. They are considered Outstanding Resource Value Waters (ORVW) under Minnesota Rules 7050.0180. This is a state designation for waters of Minnesota that have high water quality, wilderness characteristics, unique scientific or ecological significance, exceptional recreational value, or other special qualities that warrant stringent protection from pollution (Minnesota Rules 7050.0180).

As well as being designated ORVW, quite a few water bodies in the BWCAW are on Minnesota's Impaired Waters (303d) list. Most of the lakes are listed because of the presence of mercury in fish tissue, while a few are listed because of the presence of PCBs in fish tissue.

Based on the Minnesota DNR wild rice inventory (MNDNR 2008), wild rice does occur sporadically in lakes throughout the project area, and it specifically occurs in 3 lakes that have infestations of purple loosestrife: Little Gabbro Lake, Gabbro Lake, and Bald Eagle Lake. Scattered individual wild rice plants occasionally occur along shorelines near some of the purple loosestrife infestations on these lakes, but there are no known stands of wild rice found near purple loosestrife infestations here or elsewhere in the project area.

3.3.5 Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would treat the fewest acres of NNIP (i.e. approximately 14.3 acres or all the known sites) of all three alternatives; the types of effects would be the same as Alternative 3 but smaller in magnitude. Digging, pulling, or cutting NNIP would generally have very little effect on aquatic resources in the BWCAW. Treatment of terrestrial NNIP could create localized areas

of soil disturbance, but these would generally be small since 85% of the sites are less than 0.005 acres. Disturbed soil would have a low potential for causing erosion and degrading water quality or affecting aquatic life because the small NNIP sites are scattered over many locations across the BWCAW, and because generally slopes at treatment sites are moderate and would have enough remaining vegetation to eliminate the risk of erosion.

Pulling aquatic NNIP like purple loosestrife could stir up sediment where plants are removed, but this effect would be small, temporary, and localized. Adequate shoreline vegetation would remain so that no shoreline erosion would result from this project.

At the three lakes where occasional wild rice plants are found near purple loosestrife, pulling this invasive would have no effect on wild rice since the wild rice grows in deeper water than purple loosestrife. Crews performing treatments would be trained not to confuse wild rice with purple loosestrife.

Most of the target NNIP are herbaceous upland species, so removing them would not affect habitat for aquatic animals. However, treating aquatic NNIP like purple loosestrife would benefit aquatic habitat by improving lower quality wetlands and encouraging native wetland plant species, including species like wild rice. Dense stands of purple loosestrife can impede water flow and reduce open water in wetlands.

Alternative 2 – Proposed Action

Alternative 2 would have a low risk of direct and indirect negative effects to water quality in the project area. Although Minnesota does not have a state water quality standard for any of the herbicides proposed for use (and none are anticipated), there is a standard for a related herbicide, picloram. Picloram is chemically very similar to aminopyralid but much more potent and persistent in the environment, which is part of the reason it has a water quality standard. Although not a perfect comparison, if we use the Minnesota picloram standard of 500 micrograms/liter (because of the chemical similiarity), we can compare the expected levels of the herbicides proposed for use to this standard and make some conclusions. This can cautiously be interpreted to better understand anticipated effects.

The RAs model scenarios where the four proposed herbicides are accidentally sprayed or drift/leach into a pond or stream. Under these scenarios, none of the proposed herbicides would exceed a concentration of 500 micrograms/liter (SERA 2006, SERA 2006, SERA 2007b, SERA 2011b), and would thus not represent a threat to water quality in the project area. The RAs also model a scenario where the four proposed herbicides are accidentally spilled into a pond, and under this scenario three of the herbicides would exceed 500 micrograms/liter (SERA 2006, SERA 2007b, SERA 2011b). This scenario is conservative, and involves spilling 200 gallons of herbicide mix into a ¼ acre pond that is 1 meter deep. If this were to actually happen in such a small water body, there would be some short term water quality impacts. However, the maximum amount of herbicide that a crew would have on a trip would be the concentrated equivalent of 10 gallons of herbicide mix, much less than the 200 gallons in the scenario, and the water quality standard would not be exceeded. Furthermore, operational standards and guidelines (OSGs - Appendix B) would greatly reduce the risk that any such spill would happen in the first place. For example, transporting herbicides in their original container which would

be inside a second watertight container, and using a catch basin that is at least 50 feet away from water for all mixing operations, would provide a margin of safety that would prevent accidental spills and impacts to water quality.

Alternative 2 would also have a very low risk of negative effects to aquatic animal life. For the four herbicides, no route of exposure or scenario suggests that the proposed use of any of the herbicides would put aquatic life at risk. For each of the scenarios in the ecological risk analysis, the HQ is below 1.0 and thus there is no plausible risk to aquatic life from these herbicides (SERA 2004, SERA 2004, SERA 2007a, SERA 2011a). Unlike some compounds like mercury, none of the proposed herbicides bioaccumulate, so there is no risk that they would enter the aquatic food chain and build up in tissues of animals at the top of the food chain.

Wild rice would not be affected by herbicide treatments of NNIP in the project area. Because of the project design such as wiping on herbicides to upland NNIP species that occur within 25 feet of the water as well as on wetland NNIP species like purple loosestrife, there would be no risk that herbicides would cause mortality or damage to individual wild rice plants (there are no wild rice stands in the lakes proposed for purple loosestrife treatments.) Herbicides would have no effect on wild rice since wild rice grows in deeper water than purple loosestrife, and because there are only three lakes where purple loosestrife and wild rice grow in the same lake. Crews performing treatments would be trained not to confuse wild rice with purple loosestrife.

The use of herbicides proposed in Alternative 2 would also not threaten the ORVW designation for the project area. Because of the project design and OSGs, a spill of herbicides is unlikely. If a spill occurs, the volume would be far too small to exceed any comparable water quality standards as explained above. Also, no discharge of herbicides (intentional release) to water bodies is proposed in the project. Therefore, there would be no adverse impacts to the water bodies in the BWCAW. For example, herbicide applied to purple loosestrife would be wiped on with a sponge, eliminating the risk that any herbicide spray would unintentionally land in the water. If standing water was present at the time of purple loosestrife treatment, handpulling would be used to treat purple loosestrife, further reducing risk. Furthermore, none of the proposed activities in Alternative 2 would cause any water bodies in the project area to be added to Minnesota's Impaired Waters list.

Containing and eradicating aquatic NNIP like purple loosestrife would benefit aquatic habitat in Alternative 2. Such treatment would improve lower quality wetland habitat and encourage native wetland plant species such as wild rice. Dense stands of purple loosestrife can impede water flow and reduce open water in wetlands. These positive effects of NNIP treatment on aquatic habitat would be greatest for Alternative 2 compared to Alternatives 1 and 3, since the treatments in Alternatives 1 and 3 would generally take longer to be effective than those proposed for Alternative 2.

Alternative 3

Alternative 3 would treat the most acres of NNIP (i.e. approximately 14.3 acres of known sites plus 600-650 acres of future infestations) of all three alternatives. Digging, pulling, or cutting NNIP would generally have very little effect on aquatic resources in the BWCAW. Treatment of terrestrial NNIP could create localized areas of soil disturbance, but these would generally be

small since 85% of the sites are less than 0.005 acres. Disturbed soil would have a low potential for causing erosion and degrading water quality or affecting aquatic life because the small NNIP sites are scattered over many locations across the BWCAW, and because generally slopes at treatment sites are moderate and would have enough remaining vegetation to eliminate the risk of erosion.

Pulling aquatic NNIP like purple loosestrife could stir up sediment where plants are removed, but this effect would be small, temporary, and localized. Adequate shoreline vegetation would remain so that no shoreline erosion would result from this project.

At the three lakes where occasional wild rice plants are found near purple loosestrife, pulling this invasive would have no effect on wild rice since the wild rice grows in deeper water than purple loosestrife. Crews performing treatments would be trained not to confuse wild rice with purple loosestrife.

Most of the target NNIP are herbaceous upland species, so removing them would not affect habitat for aquatic animals. However, treating aquatic NNIP like purple loosestrife would benefit aquatic habitat by improving lower quality wetlands and encouraging native wetland plant species, including species like wild rice. Dense stands of purple loosestrife can impede water flow and reduce open water in wetlands. These positive effects of NNIP treatment on aquatic habitat would be less for Alternative 3 compared to Alternative 2, since the treatments in Alternative 3 would generally take longer to be effective than those proposed for Alternative 2. The positive effects of the treatments would be greater for Alternative 3 than Alternative 1 since Alternative 3 proposes to treat more acres than Alternative 1.

Conclusion

The risk of negative effects to aquatic resources from Alternatives 1 and 3 are very low. The risk of negative effects from herbicide use in Alternative 2 is also low. Under Alternative 2 no water quality standards would be exceeded, and herbicide use would have a very low risk of negative effects to aquatic life. No herbicide would be discharged to water bodies under Alternative 2, and Alternative 2 would cause no water bodies to be added to Minnesota's Impaired Waters List. All alternatives would benefit aquatic habitat by controlling and eradicating NNIP. The benefit would be largest for Alternative 2.

Cumulative Effects

Because Alternatives 1 and 3 would have very low effects to aquatic resources, these alternatives would also have no cumulative effects to aquatic resources.

There is low potential for the risk of cumulative effects to water resources from the use of herbicides proposed in Alternative 2. Cumulative effects could arise from repeated exposure of aquatic life to herbicide, such as if a fish were exposed to herbicides both from this project as well as from treatments at BWCAW entry points conducted under the 2006 Superior National Forest NNIP Management Project (Appendix J).

Forest Service risk assessments consider the effects of both single (acute) and repeated or chronic exposures by assessing the exposure levels for each herbicide. Chronic long-term exposure scenarios are based on a long term repeated exposure from contaminated water.

This analysis specifically considers the effect of repeated exposure in the chronic exposure scenarios and through the use of the chronic NOAEL as an index of acceptable exposure. For all of the chronic herbicide exposure scenarios, the HQs are two to eight orders of magnitude less than 1, indicating an acceptable level of cumulative risk. Consequently, repeated exposure to levels below the toxic threshold would not be associated with cumulative toxic effects. No cumulative impacts from repeated exposures in the past, present, or foreseeable future are predicted.

3.4 NON-NATIVE INVASIVE PLANTS

3.4.1 Introduction

The BWCAW NNIP Management Project proposes three alternatives for treating invasive plants in the wilderness: manual treatments alone (at two different levels), or a combination of manual treatments and herbicide treatments. This chapter describes the current condition of NNIP in the BWCAW and describes the effects of the three alternatives on NNIP abundance in the project area.

3.4.2 Analysis Methods

This chapter uses a qualitative analysis to compare the effects of the alternatives on non-native invasive plants.

3.4.3 Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest within the project area for the BWCAW NNIP Management Project. This area was selected because this is where project activities will occur which cause the direct and indirect effects. The area covered by the cumulative effects analysis includes lands of all ownerships within the project area for the BWCAW NNIP Management Project. This cumulative effects analysis area was selected because non-federal lands within project area boundaries share a number of physical characteristics (e.g. soils, landforms, etc.) with adjacent National Forest lands. NNIP that occur on these adjacent lands may be treated by this project. Because treatments may occur on these lands and because they are intermingled with federal lands in the project area, the BWCAW NNIP Management Project boundary makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities will occur until implementation, and because most project activities should be completed within ten years.

3.4.4 Affected Environment

Table 8 displays the non-native invasive plants that are known to occur in the project area. This list was developed based on results from NNIP inventory data. The inventory is on-going and generally focuses on disturbed areas such as campsites, portages, burned areas, and old cabin or resort sites. There are approximately 14.3 acres of NNIP scattered over 1137 locations, ranging

in size from 0.0002 acres to 1.7 acres. 55% of the sites are less than 25 square feet. Of the 1137 known NNIP occurrences, most occur on campsites (48%), while others occur on portages or trails (26%), along shorelines (13%), at old resort/ cabin sites (7%), or in burned areas (6%). Depending on numerous factors such as shade tolerance, degree of invasiveness, dispersal mechanisms, and habitat availability, NNIP may or may not spread into adjacent forested or non-forested ecosystems.

The sources of NNIP in the BWCAW can sometimes be difficult to pinpoint. For the Canada thistle that appeared in the Alpine Lake Fire burned area, it most likely came from some Canada thistle infestations at nearby campsites. Goutweed only occurs at old cabin sites where it had been planted as an ornamental. Most of the spotted knapweed in the BWCAW is on the Pow-Wow Trail, and all of it originated at the old logging community Forest Center. However, most of the sources of NNIP in the BWCAW are hard to determine. Since a large proportion of NNIP in the BWCAW occur at campsites and portages, presumably seeds hitchhiked on visitors' boots or gear. Seeds can get transported by firefighters during fire incidents. Wind and wildlife can also transport NNIP seeds. Most people enter the project area at BWCAW entry points, so NNIP at entry points can serve as sources of new infestations. It is less likely but also possible that harvest units near the project area could serve as sources of NNIP.

Table 8. Non-native Invasive Plants in the BWCAW NNIP Management Project Area

Species	MN Status*	Life History/Habitat Summary	Acres	Ecological Risk**
Goutweed *Aegopodium podigraria*	No status	Herbaceous perennial, garden escape, strong vegetative spread by rhizomes but can also produce seed, usually found at old resort/cabin sites (Czarapata 2005)	1.8	High
Siberian peabush *Caragana arborescens*	No status	Perennial shrub, can spread by seed or vegetatively, used in past as reclamation species for mine tailings and as an ornamental shrub(MNDNR 2012)	0.0002	High
Spotted knapweed *Centaurea maculosa*	P	Short lived taprooted herbaceous perennial, spread entirely by seeds, dry to mesic uplands (Wilson and Randall 2002)	3.4	High
Canada thistle *Cirsium arvense*	P	Herbaceous perennial, spread by seed and rhizome, occupies disturbed sites (Lym and Christianson 1996)	2.9	High
Bull thistle *Cirsium vulgare*	No status	Taprooted herbaceous biennial, spread by seed, occupies disturbed sites (Lym and Christianson 1996)	0.07	Low
Cypress spurge *Euphorbia cyparissias*	No status	Moderately aggressive herbaceous perennial spread by rhizome and seed (Czarapata 2005)	0.1	Moderate
Leafy spurge *Euphorbia esula*	P	Aggressive herbaceous perennial, spread by seed and rhizome, dry to mesic uplands (Lym and Zollinger 1995)	0.02	High
Exotic hawkweeds Includes orange hawkweed *(Hieracium auranticum),* meadow hawkweed *(H.*	No status	Several similar non-native invasive hawkweeds occur in Project Area; species have either orange or yellow flowers; herbaceous perennial, spread by seed and rhizome, widespread in disturbed upland sites	2.8	Moderate

caespitosum), king devil hawkweed *(H. piloselloides)*		(Callihan et al. 1982)		
St. Johnswort *Hypericum perforatum*	No status	Herbaceous perennial; spread by seed and lateral roots, dry to mesic uplands (Krueger and Sheley 2002)	0.004	Moderate
Oxeye daisy *Leucanthemum vulgare*	No status	Herbaceous perennial, spread primarily by seed; rhizomes present; widespread in disturbed upland sites (Krueger and Sheley 2002)	1.5	Moderate
Tatarian honeysuckle *Lonicera tatarica*	No status	Perennial shrub spread primarily by bird dispersed berries, can colonize in forest areas (Czarapata 2005)	0.02	High
Purple loosestrife *Lythrum salicaria*	P	Aggressive herbaceous perennial; spread by seed and rhizome; wetlands and road ditches (MNDNR 2012)	0.3	High
Common tansy *Tanacetum vulgare*	P	Herbaceous rhizomatous perennial, spread mostly by seed; disturbed uplands (LeCain and Sheley 2011)	1.4	Moderate

* **P** = Prohibited noxious weed (Minnesota Statutes 18.76 to 18.91) that must be controlled.

**Species represent either a low, moderate, or high threat to natural communities (USDA Forest Service 2010). Risk given in table represents risk in most susceptible habitat.

Preventing NNIP infestations is much more cost-effective than trying to eradicate them, and this is an ongoing effort on the Superior National Forest. Prevention and other integrated pest management strategies are described in more detail in Appendix H. Prevention measures such as installation of boot brushes at some BWCAW trailheads, firefighter gear cleaning, and Leave No Trace training for BWCAW visitors and Superior National Forest employees are examples of actions we are taking to keep NNIP out of the BWCAW. Prevention efforts will continue regardless of what decision is made regarding this project.

Depending on numerous factors such as shade tolerance, degree of invasiveness, dispersal mechanisms, and habitat availability, NNIP may or may not spread into adjacent forested or non-forested ecosystems. Mesic forested sites with shady understories on the Superior National Forest are fairly resistant to invasion by most NNIP. Any NNIP that disperse into such plant communities tend to get out-competed quickly by native shrubs, forbs, and trees. However, some NNIP are exceptions to this general observation. For example, Tatarian honeysuckle and Siberian peabush can thrive in the understory of mesic native plant communities. There is a small amount of both of these species in the project area.

There are also a number of native plant communities typical of droughty, shallow-soiled sites that are susceptible to invasion by NNIP. These sites have less abundant shrub and forb layers, and as a result are more susceptible to being invaded by NNIP, especially if some ground disturbance occurs. These types of sites correspond to Ecological Landtypes (ELTs) 7, 9, 11, 16, 17, and 18. Most susceptible among these are rock outcrops (including cliff communities), which correspond to ELT 18 (ELT 18 is zero to eight inches of soil over bedrock). This type of habitat is common in the project area. Wetlands and shorelines are suitable habitat for purple loosestrife, and shorelines with fluctuating water levels are good habitat for Canada and bull thistle; these types of habitats are also common in the project area.

3.4.5 Environmental Consequences
Direct and Indirect Effects

Alternative 1 – No Action
Although the effects of manual treatments to NNIP were not analyzed in the 2006 Superior National Forest Non-Native Invasive Plant Management Environmental Assessment, the proposed treatment methods under Alternative 1 are the same as for Alternative 3, and the effects would be similar. Alternative 1 would result in the containment and eradication of the approximately 14.3 acres of known NNIP sites in the project area. Eradicating small populations of tap-rooted species would take 2-3 treatments and 3-5 treatments for small populations of rhizomatous species. Controlling large populations of tap-rooted species would take 3-5 treatments and up to 10 treatments of rhizomatous species. Manual methods are more effective at treating tap-rooted species because the root is usually removed all at once, thus killing the plant. Rhizomatous species are difficult to control by manual methods because it is very difficult to remove all of the lateral, spreading roots by pulling or digging – some usually remain behind to re-sprout later.

Based on monitoring of NNIP after the 2005 Alpine Lake Fire, which showed that in spite of hand pulling approximately 10% of the burned area became infested with NNIP over five years, the interdisciplinary team forecasts that approximately 600-650 acres of NNIP spread will occur under Alternative 1 in the project area, primarily in the Pagami Creek Fire burned area. Alternative 1, which would continue treatments authorized by the 2006 Decision Notice for the Superior National Forest Non-native Invasive Plant Management Project, would not provide for treating any of the forecast future NNIP spread. Much more NNIP spread would be likely to occur under Alternative 1 than Alternative 2 or 3.

Manual methods of NNIP control often result in the disturbance of the soil surface. This disturbance does not go very deep, usually less than half an inch, but it is enough to expose dormant weed seeds in the soil to light and encourage them to germinate. Germination of NNIP seeds from the soil seed bank can extend the number of re-treatments necessary to control a population of NNIP.

Alternative 2 – Proposed Action
Alternative 2 would result in the containment and eradication of the approximately 14.3 acres of known NNIP sites in the project area faster and with fewer re-treatments and less expected NNIP spread than Alternatives 1 or 3. Like Alternatives 1 or 3, Alternative 2 would use manual methods for the two tap-rooted species. Eradicating small populations of tap-rooted species would take 2-3 treatments and 2 herbicide treatments for small populations of rhizomatous species. Controlling large populations of tap-rooted species would take 3-5 treatments and 2-4 herbicide treatments for rhizomatous species. Approximately 7% of the infestations are tap-rooted species and 93% are rhizomatous species; this difference contributes greatly to faster and fewer re-treatments associated with herbicide treatments.

The interdisciplinary team used a combination of professional judgement and NNIP monitoring data from the 2005 Alpine Lake Fire to forecast the approximately 40-60 acres of additional NNIP spread expected in the Pagami Creek Fire burned area if a combination of manual methods

and herbicides are used. Using the NNIP spread rate that was observed in the Alpine Lake Fire burned area, the team forecast approximately 20 acres of spread in 2012 and 40 additional acres in 2013. In 2013 under the proposed action we would implement herbicide and manual methods of NNIP control. Outside the BWCAW where we treat NNIP with herbicide, the treatment effectiveness rate is approximately 80% (USDA Forest Service 2011). Assuming this treatment effectiveness holds in the BWCAW, we expect the approximately 40-60 acres of NNIP to plateau at that amount and gradually decline.

Herbicide treatments are more effective at eliminating rhizomatous species than manual treatments because the herbicides are translocated from the leaf where they are taken up to the root where they act. They travel down the rhizomes and lateral roots and effectively kill the target plant, whereas rhizome fragments are left in the soil with manual treatments. The soil is not disturbed during herbicide treatments so fewer NNIP seeds germinate from the soil seed bank compared to manual treatments, and thus co-existing vegetation on the site has a chance to reclaim the site.

Alternative 3

Alternative 3 would result in the containment and eradication of the approximately 14.3 acres of known NNIP sites in the project area. Eradicating small populations of tap-rooted species would take 2-3 treatments and 3-5 treatments for small populations of rhizomatous species. Controlling large populations of tap-rooted species would take 3-5 treatments and up to 10 treatments of rhizomatous species. Manual methods are more effective at treating tap-rooted species because the root is usually removed all at once, thus killing the plant. Rhizomatous species are difficult to control by manual methods because it is very difficult to remove all of the lateral, spreading roots by pulling or digging – some usually remain behind to re-sprout later.

Based on monitoring of NNIP after the 2005 Alpine Lake Fire, which showed that in spite of hand pulling approximately 10% of the burned area became infested with NNIP over five years, the interdisciplinary team forecasts that approximately 600-650 acres of NNIP spread will occur under Alternative 3 in the project area, primarily in the Pagami Creek Fire burned area. Alternative 3 proposes to treat these new infestations.

Manual methods of NNIP control often result in the disturbance of the soil surface. This disturbance does not go very deep, usually less than half an inch, but it is enough to expose dormant weed seeds in the soil to light and encourage them to germinate. Germination of NNIP seeds from the soil seed bank can extend the number of re-treatments necessary to control a population of NNIP.

Conclusion

Alternative 2 would result in the containment and eradication of the known NNIP infestations in the project area faster and with fewer re-treatments than Alternative 3. There would be much less NNIP spread during project implementation under Alternative 2 than Alternatives 1 or 3. There would be less ground disturbance associated with Alternative 2 than Alternative 1 or 3 so fewer NNIP seeds would germinate out of the soil under Alternative 2.

Cumulative Effects

NNIP seeds from sources outside of the project area could lead to a small cumulative increase in NNIP infestation in Alternatives 1, 2, and 3. As noted in the Affected Environment section above, sources of NNIP infestations can be hard to pinpoint, but could certainly include sources outside of the project area such as entry points. In many ways this a likely possibility since most people enter the wilderness at entry points. NNIP seeds could get picked up on shoes or gear from infestations at entry points or roads leading to entry points and transported into the project area. Treatment efforts since 2006 have focused on reducing this source of NNIP. The Isabella Lake entry point is a good example. The parking lot used to be ringed with spotted knapweed (Figure 5), but treatments started in 2006 have reduced the infestation to trace amounts at this location (Figure 5) so visitors have much less likelihood of transporting knapweed seed from this source.

Vegetation management activities (both timber harvest and fuels management - Appendix J) outside of but adjacent to the BWCAW could also create ground disturbance which could favor establishment of NNIP that could act as a source for NNIP in the wilderness. This effect has been analyzed in recent vegetation management projects where management activities have been proposed adjacent to the BWCAW. These include: Echo Trail (2007), Glacier (2009), Border (2009), Twins (2010), Toohey (2011), and Birch (2011). Vegetation management actions on state and county ownership immediately adjacent to the BWCAW could also have a similar effect. Likewise, the South Fowl Lake Snowmobile Access Project (2012), which would construct a new snowmobile

Figure 5. Left, spotted knapweed at entry point parking lot pre-treatment. Right, same location one year after treatment, dominated by a native grass.

trail segment at the end of the Arrowhead Trail, analyzed the effects of the project on NNIP and the BWCAW.

There is a low risk that NNIP originating in recent or future harvest units adjacent to the BWCAW would be a major source of future NNIP infestations in the project area. First, mitigations are applied on National Forest lands to the vegetation management activities to reduce the likelihood of NNIP spread. These include winter harvest, equipment cleaning, treating NNIP prior to harvest, and road decommissioning.

Second, if NNIP do establish in vegetation management units near the BWCAW, they still have a low likelihood of establishing in the BWCAW. Several events would need to happen for NNIP to move from, for example, a timber harvest unit into the BWCAW. First, NNIP would need to get established in disturbed areas of the unit near the BWCAW. Monitoring of harvest units on the Superior National Forest has shown that this does happen, but that infestations are typically small (USDA Forest Service 2008). Second, some vector (most likely wind or wildlife) would have to transport NNIP seeds from established populations into the wilderness, where no comparable ground disturbance is proposed. Lastly, NNIP would have to establish in competition with undisturbed native vegetation, which is unlikely. A recent study of non-native plants on BWCAW portages found that non-natives were restricted to portages or within one meter of a portage (Dickens et al. 2005); they did not establish well when competing with native trees, shrubs, and forbs. Similarly, in recent monitoring of old road corridors, no spread was observed from weed infestations along roads into adjacent undisturbed forest vegetation (USDA Forest Service 2008). In conclusion, although the scenario described above is possible, the risk of establishment in the harvest unit followed by dispersal to the BWCAW followed by establishment in undisturbed vegetation of the BWCAW is low.

The portion of the Pagami Creek Fire that is close to the project area boundary is an exception to the scenario described above. The native vegetation in this area has been disturbed and is susceptible to seeds transported into the area. However, the Superior National Forest received emergency funds in 2012 that were used to inventory and treat NNIP in this area (e.g. such as firelines crossing into the BWCAW) as well as to improve a barrier to motorized intrusion on the PowWow Trail. Such efforts are expected to limit the cumulative impacts of NNIP.

Minerals management activities outside of but adjacent to the BWCAW could also create ground disturbance which could favor establishment of NNIP that could act as a source for NNIP in the wilderness. This effect was analyzed in the recent Federal Hardrock Mineral Prospecting Permit EIS (2012). This analysis disclosed that the risk of NNIP spread to the BWCAW as the result of mineral prospecting activities is very low. The risk of cumulative impacts from minerals management activities is low.

One ongoing activity in the project area is fuels treatments implemented under the 2001 BWCAW Fuels Treatment EIS (Appendix J). Fuels treatments under this project would have minor cumulative effects to NNIP. Prescribed burns for fuel reduction generally are cooler burns than wildfires and thus expose much less soil compared to wildfires; this in turn creates a low cumulative risk of NNIP spread for Alternatives 1, 2, and 3.

Management activities in the BWCAW such as routine campsite and portage maintenance would have minor cumulative effects on NNIP in the project area, as would proposed campsite construction/relocation projects such as those on Slim Lake or Dent Lake or other projects described in Appendix J. Clearing areas for campsite construction or maintenance activities would slightly increase the cumulative risk of NNIP spread but the area affected would be small.

Lastly, as noted above in the Affected Environment, NNIP prevention is an ongoing effort on the Superior National Forest that will be implemented regardless of which alternative is chosen by

the Forest Supervisor. Prevention and education efforts are described in more detail in Appendix H.

3.5 NATIVE PLANTS

3.5.1 Introduction

During project scoping, the public raised concerns that native plants in the project area could be adversely affected by herbicides proposed for use. This section examines this potential effect and describes the risk of impacts to native plant species.

3.5.2 Analysis Methods

This chapter uses a qualitative analysis to compare the effects of the alternatives on native plants found in the project area.

3.5.3 Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest within the project area for the BWCAW NNIP Management Project. This area was selected because this is where project activities will occur which cause the direct and indirect effects. The area covered by the cumulative effects analysis includes lands of all ownerships within the project area for the BWCAW NNIP Management Project. This cumulative effects analysis area was selected because non-federal lands within project area boundaries share a number of physical characteristics (e.g. soils, landforms, etc.) with adjacent National Forest lands. NNIP that occur on these adjacent lands may be treated by this project. Because treatments may occur on these lands and because they are intermingled with federal lands in the project area, the BWCAW NNIP Management Project boundary makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities will occur until implementation, and because most project activities should be completed within ten years.

3.5.4 Affected Environment

Currently the project area is dominated by native plants, and non-native plants make up a small portion all the species in the project area as a whole. Using a vascular plant checklist maintained by the MN DNR (MNTaxa database), a query of northern St. Louis, Lake, and Cook Counties shows that over 750 plant species occur in the project area, and approximately 10% are non-native (MNDNR 2012), and an even smaller fraction are considered invasive.

Most of the project area lies within the Border Lakes ecological subsection. The Border Lakes is characterized by scoured bedrock uplands or shallow soils over bedrock with many lakes. The vegetation is predominantly forest or woodland plant communities. The most abundant forest communities are jack pine, mixed hardwood-conifer, and red pine/white pine. The understory native plant communities range from poorer dry-mesic communities with species like blueberry, serviceberry, wild rose, sweet fern, pipsissewa, and wintergreen to more mesic plant communities with species like hazelnut, mountain maple, honeysuckles, bunchberry, bluebead lily, and Canada mayflower. Disturbances like fire and wind play an important role in shaping these native plant communities.

3.5.5 Environmental Consequences
Direct and Indirect Effects

Alternative 1 – No Action
Although the effects of manual treatments to native plants were not analyzed in the 2006 Superior National Forest Non-Native Invasive Plant Management Environmental Assessment, the proposed treatment methods under Alternative 1 are the same as for Alternative 3, and the effects would be similar. Under Alternative 1, manual removal of NNIP would have some direct but minor negative impacts to native plants. Sometimes the natives and non-native invasives grow close together, and removing the NNIP damages the roots or occasionally uproots the native species. For example, pulling purple loosestrife sometimes yields a root mass that holds a fist-sized ball of soil with some native plants like spearwort (*Ranunculus flammula*) or purple monkeyflower (*Mimulus ringens*) growing in it. However, the area affected is very small and most native plants at the treatment site would not be affected. Most manual treatments would impact only the target NNIP.

Because Alternative 1 cannot respond to the estimated spread of 600-650 acres of NNIP in the next ten years, the indirect benefits of containing or eradicating NNIP would be much less with Alternative 1 than Alternatives 2 or 3. Over the longer term manual removal would have some indirect benefit to native plants such as restoring native plant communities, reducing competition with native plants, and improving wildlife habitat, but the benefit would be limited compared to Alternatives 2 or 3.

Alternative 2 – Proposed Action
Under Alternative 2, herbicide treatments would have some direct but minor negative impacts to non-target native plants. There would be no impacts to non-target native plants when herbicide is wiped on to NNIP – herbicide would only kill the NNIP. However, when herbicide is spot-applied with a spray wand to NNIP, some herbicide could get on immediately adjacent shrubs, grasses, or forbs. This non-target application could damage some of the aboveground growth of shrubs or forbs or kill them outright, depending on how much herbicide landed on leaves of the non-target plant. However, grasses, rushes, or sedges would not be affected because the herbicides proposed for use selectively kill only broad-leaf plants. The impacts to non-target native plants would be minor because applicators would be trained how to spot apply herbicide, focusing the spray only on the target plants and spraying only to the point of run-off (i.e. when the herbicide just begins to drip off the leaves). Operational standards and guidelines would also limit spot application to weather conditions that do not promote herbicide drift. Non-target impacts to native plants would be small under Alternative 2.

Over the longer term the combination of herbicide treatment and manual removal would have an indirect benefit to native plants. Containing or eradicating NNIP would help restore native plant communities, reduce competition with native plants, and improve wildlife habitat. The herbicides proposed for use do not remain active in the soil for long periods of time (Appendix D), so treatment sites would be colonized by adjacent plant species by the following growing season. Herbicide treatments would not cause large gaps where no plants would grow in the future.

Alternative 2 would have a greater long term benefit to native plants than Alternatives 1 or 3. Use of herbicides would require fewer treatments and have more rapid control of NNIP compared to manual treatments, so native plant species recovery would happen quicker under Alternative 2 compared to Alternatives 1 or 3.

Alternative 3

Under Alternative 3, manual removal of NNIP would have some direct but minor negative impacts to native plants. Sometimes the natives and non-native invasives grow close together, and removing the NNIP damages the roots or occasionally uproots the native species. For example, pulling purple loosestrife sometimes yields a root mass that holds a fist-sized ball of soil with some native plants like spearwort (*Ranunculus flammula*) or purple monkeyflower (*Mimulus ringens*) growing in it. However, the area affected is very small and most native plants at the treatment site would not be affected. Most manual treatments would impact only the target NNIP.

Over the longer term manual removal would have an indirect benefit to native plants. Containing or eradicating NNIP would help restore native plant communities, reduce competition with native plants, and improve wildlife habitat.

Conclusion

Alternatives 1, 2, and 3 would not differ greatly in their effects to native plants. All three would have minor short term effects to native plants, with Alternative 2 having a higher likelihood of effects than Alternatives 1 and 3. However, in the long term all alternatives would benefit native plants. Native plant species recovery would happen quicker under Alternative 2 compared to the other alternatives.

Cumulative Effects

There would be only minor cumulative effects of Alternatives 1, 2, and 3 to native plants. Management activities in the BWCAW such as routine campsite and portage maintenance would have minor cumulative effects on native plants in the project area, as would proposed campsite construction/relocation projects such as those on Slim Lake or Dent Lake (see Appendix J). Clearing areas for campsite construction or maintenance activities would reduce the abundance of native plants in small areas but the larger landscape would still be dominated by native plants.

Fire management activities in the project area, whether for wildland fire or prescribed fires such as those considered under the 2001 BWCAW Fuel Treatment EIS, could also have minor negative cumulative impacts on native plants. For example, fire line constructed for the Pagami Creek Fire in the project area created very local negative impacts to native plants, but most of this disturbance would likely be recolonized by native plants under either Alternatives 1, 2, or 3. It is reasonable to expect future wildland and prescribed fires in the project area, and these would have similar cumulative effects under all alternatives.

Besides fire suppression activities, prescribed fires and wildland fires can affect native plants by killing plants and burning up plant material. Under Alternatives 1, 2, and 3 both types of fires are expected to occur in the project area and impact native plants, and the effects to native plants would be at a much larger scale than the effects caused by the BWCAW NNIP Management

Project. For example, the Pagami Creek Fire burned approximately 84,158 acres in the project area, and under Alternative 1 600-650 acres of NNIP spread are expected, or less than 1% of the project area. In the short term, the project area would still be dominated by native plants and the cumulative effects of Alternatives 1, 2, and 3 would be minor.

3.6 THREATENED AND ENDANGERED SPECIES

3.6.1 Introduction

Resource management projects that may affect federally listed threatened or endangered Species are assessed in a biological assessment (BA). The BWCAW NNIP Management Project Biological Assessment documents the potential effects on Canada lynx and its critical habitat. The BWCAW NNIP Management Project Biological Assessment tiers to the Programmatic Biological Assessment for the revision of the Forest Plan (2004 and 2011) and provides more specific information on site-specific effects of the project to threatened and endangered species. Rather than repeat the information from the BA, this section summarizes the key findings and determinations and incorporates by reference the BA which is available in the project record or on the Superior National Forest website at www.fs.usda.gov/goto/superior/projects under the BWCAW NNIP Management Project.

The determination of effects in the BA was based on consideration of direct, indirect, and cumulative effects of the proposed activities. The effects of the alternatives were compared using the SERA risk analyses and other relevant scientific information. The analysis used currently accepted and applicable scientific literature and other scientific sources, as well as information from species experts and professional judgment of Forest Service biologists. The key sources for species information include those developed for the Forest Plan (Forest Plan FEIS, vol. 1, Section 3.3.4; vol. 2, p. B-29) and Forest Plan Biological Assessment (USDA Forest Service 2004 and USDA Forest Service 2011).

The determination of effects is made in consultation with the U.S. Fish and Wildlife Service to help them determine whether or not a proposed action is likely to jeopardize the continued existence of a listed species. The following definitions are used to make a conclusion on the effects of a project to threatened and endangered species:

- **No Effect**
- **May affect but not likely to adversely affect** – used when it is determined that direct or indirect effects on listed species from the proposed alternatives are expected to be discountable, insignificant, or completely beneficial.
- **May affect and is likely to adversely affect** – used if any adverse effect to listed species may occur as a direct or indirect result of the proposed alternatives and the effect is not discountable, insignificant or beneficial, or the effect will harm, harass or wound the species.

Although no concurrence was required for this project because of the no effect determination, the Fish and Wildlife Service was contacted as a courtesy and provided a copy of this BA.

3.6.2 Determination of Effects for Canada Lynx

None of the alternatives would negatively impact Canada lynx habitat. Under all alternatives, selectively removing NNIP from both known and future infestations would not negatively affect hare habitat or lynx denning habitat. The infestations sites are small and widely scattered across the BWCAW, and over 80% of the NNIP infestations are at sites frequented by humans like campsites, portages, trails, or old resort/cabin sites. This project would not involve construction of any new access routes. Under Alternative 2 there would be no impacts of herbicide use to lynx because the herbicides proposed for use are low toxicity, the use would be very dispersed, and because the herbicide exposure routes involving lynx prey are very unlikely. All alternatives would help limit future impacts of NNIP to lynx. Alternative 1, Alternative 2, and Alternative 3 of the BWCAW NNIP Management Project would each have no effect on the Canada lynx or its critical habitat.

3.7 REGIONAL FORESTER SENSITIVE SPECIES

3.7.1 Introduction

Regional Forester's Sensitive Species (RFSS) are species for which population viability is a concern due to one or a combination of several factors: habitat and species rarity or poor distribution; a declining trend in population; risk to habitat integrity; and population vulnerability. Information on how species were screened and selected is provided in the Forest Plan Final Environmental Impact Statement (FEIS) (Forest Plan FEIS, Volume 2, pp. B-25 to B-26) and on the Forest Service website for sensitive species at www.fs.fed.us/r9/wildlife/tes/tes_lists.htm. The RFSS list for the Superior National Forest was recently updated and approved by the Regional Forester. The Biological Evaluation is the tool used to consider the effects of a project on RFSS. The determinations in a biological evaluation address the question of how alternatives affect species viability at the local level, and resulting implications for species viability and distribution throughout the range. The analysis of effects results in one of the following determinations:

- **No impact**
- **Beneficial effects** – used when proposed alternative is determined to be wholly beneficial without potential negative impacts.
- **May impact individuals but is not likely to cause a trend to federal listing or loss of viability** – used when it is determined the proposed alternative may cause some negative effects, even if overall effect to species may be beneficial
- **High risk of loss of viability** in the planning area (National Forest), but not likely to cause a trend toward federal listing. Or, likely to result in a loss of viability and a trend toward federal listing.

The effects of the BWCAW NNIP Management Project alternatives to Regional Forester Sensitive Species are documented in three biological evaluations: 1) terrestrial animals, 2) aquatic animals, and 3) plants. These Biological Evaluations are available on the Superior National Forest website at www.fs.usda.gov/goto/superior/projects under the BWCAW NNIP Management Project and in the project record.

3.7.2 Determination of Effects Summary for Terrestrial Wildlife

Alternative 1 would have no impact on heather vole, northern goshawk, boreal owl, great grey owl, wood turtle, Mancinus alpine, red disked alpine, Jutta arctic, Nabokov's blue, Freija's grizzled skipper, little brown myotis, northern myotis, tri-colored bat, gray wolf, or bald eagle.

Alternative 1 may impact individuals of olive sided fly catcher, bay breasted warbler, or Connecticut warbler, but is not likely to result in a trend towards federal listing or a loss of viability.

Alternative 2 would have no impact on northern goshawk, boreal owl, gray wolf, olive-sided flycatcher, little brown myotis, northern myotis, tri-colored bat, bay-breasted warbler, bald eagle, Connecticut warbler, three-toed woodpecker, great gray owl, Frieja's grizzled skipper, Taiga alpine, or Nabokov's blue.

Alternative 2 may impact individual Eastern heather vole, but is not likely to cause a trend to federal listing or a loss of viability.

Alternative 3 would have no impact on any terrestrial RFSS wildlife species.

3.7.3 Determination of Effects Summary for Aquatic Animals

Alternative 1 would have no impact on shortjaw cisco, Nipigon cisco, headwaters chilostigman caddisfly, ebony boghaunter, and Quebec emerald.

Alternative 1 may impact individuals of lake sturgeon, northern brook lamprey, creek heelsplitter, and black sandshell but is not likely to result in a trend towards federal listing or a loss if viability.

Alternative 2 would have no impact on any aquatic RFSS species.

Alternative 3 would have no impact on any aquatic RFSS species.

3.7.4 Determination of Effects Summary for Plants

For Alternative 1, the proposed activities would have no impact on alpine milkvetch, creeping rush, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes' pondweed, awlwort, lance-leaved violet, *Cladonia wainoi*, large-leaved sandwort, long leaved arnica, maidenhair spleenwort, Ross' sedge, sticky locoweed, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga,* Douglas hawthorne, Appalachian fir clubmoss, small shinleaf, cloudberry, fairy slipper, ram's head ladyslipper, western Jacob's ladder, *Caloplaca parvula, Certraria aurescens, Frullania selwyniana, Menegazzia terebrata, Ramalina thrausta, Sticta fuliginosa, Usnea longissima*, *Pseudocyphellaria crocata,* moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, Braun's holly fern, Canada yew, barren strawberry, Canada ricegrass, rough fruited fairy bells, or *Peltigera venosa*.

The proposed activities in Alternative 1 may impact individuals of common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, and least moonwort but are not likely to cause a trend to federal listing or loss of viability.

For Alternative 2, the proposed activities would have no impact on alpine milkvetch, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, creeping rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes pondweed, awlwort, lance-leaved violet, fairy slipper, ram's head ladyslipper, small shinleaf, cloudberry, *Caloplaca parvula*, *Certraria aurescens*, *Frullania selwyniana*, *Menegazzia terebrata*, *Pseudocyphellaria crocata*, *Ramalina thrausta*, *Sticta fuliginosa*, *Usnea longissima*, Ross' sedge, sticky locoweed, Canada ricegrass, rough-fruited fairybells, Canada yew, barren strawberry, *Peltigera venosa*, moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, false asphodel, and western Jacob's ladder.

For Alternative 2, the proposed activities may impact individuals of long-leaved arnica, maidenhair spleenwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, least moonwort, Douglas hawthorn, large-leaved sandwort, Appalachian fir clubmoss, Braun's holly fern, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, and *Cladonia wainoi* but are not likely to cause a trend to federal listing or loss of viability.

For Alternative 3, the proposed activities would have no impact on alpine milkvetch, swamp beggar-ticks, floating marsh-marigold, linear-leaved sundew, neat spike rush, moor rush, creeping rush, auricled twayblade, fall dropseed muhly, American shoregrass, dwarf water lily, Oakes pondweed, awlwort, lance-leaved violet, fairy slipper, ram's head ladyslipper, small shinleaf, cloudberry, *Caloplaca parvula*, *Certraria aurescens*, *Frullania selwyniana*, *Menegazzia terebrata*, *Pseudocyphellaria crocata*, *Ramalina thrausta*, *Sticta fuliginosa*, *Usnea longissima*, Ross' sedge, sticky locoweed, Canada ricegrass, rough-fruited fairybells, Canada yew, barren strawberry, *Peltigera venosa*, moschatel, triangle grapefern, goblin fern, New England sedge, Chilean sweet cicely, false asphodel, and western Jacob's ladder.

For Alternative 3, the proposed activities may impact individuals of long-leaved arnica, maidenhair spleenwort, common moonwort, Michigan moonwort, pale moonwort, ternate grapefern, least moonwort, Douglas hawthorn, large-leaved sandwort, Appalachian fir clubmoss, Braun's holly fern, nodding saxifrage, encrusted saxifrage, smooth woodsia, *Arctoparmelia centrifuga*, *Arctoparmelia subcentrifuga*, and *Cladonia wainoi* but are not likely to cause a trend to federal listing or loss of viability.

3.8 WILDLIFE

3.8.1 Introduction

During project scoping, the public raised concerns that wildlife in the project area could be adversely affected by the herbicides proposed for use. This section examines this potential effect and describes the risk of impacts to wildlife species.

3.8.2 Analysis Methods

The analysis below compares the proposed use of herbicides in this project to the outcomes of Forest Service herbicide risk analyses. The USDA Forest Service contracted with Syracuse Environmental Research Associates (SERA) to evaluate ecological and toxicological data based on Environmental Protection Agency (EPA) studies and other current peer-reviewed scientific literature. Analysis of the risks to wildlife resources from the proposed use of herbicides is based on SERA Human Health and Ecological Risk Assessments (RAs), their associated worksheets, and other documents. The SERA RAs and worksheets are incorporated into this analysis and can be found at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

SERA's risk assessments quantitatively characterize the risks for all four herbicides proposed for use in this project (RAs: metsulfuron methyl - SERA 2004; imazapic - SERA 2004; aminopyralid - SERA 2007a; triclopyr - SERA 2011a; worksheets: metsulfuron methyl – SERA 2006; imazapic – SERA 2006; aminopyralid – SERA 2007b; triclopyr – SERA 2011b and SERA 2011c). The RAs quantify hazards posed by the herbicides, quantitatively estimate wildlife resources exposure to herbicide, and describe a dose-response relationship to come up with the ecological risk of the herbicide to wildlife resources.

The toxicities of the four herbicides proposed for use are presented in detail in FEIS Appendix D. During the herbicide registration process, the EPA evaluated the toxicity of all of these herbicides on wildlife and aquatic resources. Judgments about the potential hazards of herbicides to these resources are based, in large part, on the results of standard acute and chronic bioassays on mammals, birds, fish, invertebrates, and in some cases amphibians. Detailed toxicological analysis and literature review for each herbicide are found in the SERA RAs. Triclopyr, imazapic, aminopyralid, and metsulfuron methyl are all low toxicity herbicides that have been used safely on the Superior National Forest for the last five years.

As part of each risk assessment, a set of general exposure scenarios was developed based on the normal use of the herbicides. These scenarios include: accidental direct spray of an organism, accidental contact with treated vegetation, eating contaminated vegetation or prey, drinking contaminated water, accidental spill in a pond, accidental spray/drift/leaching into a pond, and accidental spray/drift/leaching into a stream. These scenarios are very conservative, and many of their assumptions model a worst-case scenario. Some of them model short-term (acute) effects, and others model long-term (chronic) effects.

During the herbicide registration process, toxicological studies are conducted on a variety of species. Generally these studies are used to develop the No Observed Adverse Effect Level (NOAEL – this is the highest level of herbicide at which no adverse effects are observed). The NOAELs are generally very conservative (i.e. health protecting) and are made even more conservative by the application of a safety factor of 100. The safety factor accounts for data uncertainty and other factors representing corrections for both intra- and inter-species variability. The RAs for these four herbicides generally compare the outcomes of the exposure scenarios to the NOAEL to evaluate whether the exposure scenarios for wildlife could potentially exceed the dose at which adverse effects begin to be observed.

The RAs combine three factors: the herbicides' inherent hazard, an estimate of exposure, and a dose-response assessment. Together, these generate an estimate of risk for each scenario for each chemical – referred to as the Hazard Quotient (HQ). The HQ is the ratio between the estimated dose (the amount of herbicide received from a particular exposure scenario) and the dose at which no adverse effect is observed. When a scenario has a dose less than the NOAEL dose, then the HQ is less than 1.0, and toxic effects are unlikely for that specific scenario. The herbicides proposed for use in this project are compared in the effects analysis based on their HQ calculated in the pertinent RA.

3.8.3 Analysis Area

The area covered by the analysis of direct and indirect effects includes all lands administered by the Superior National Forest within the project area for the BWCAW NNIP Management Project. This area was selected because this is where project activities will occur which cause the direct and indirect effects. The area covered by the cumulative effects analysis includes lands of all ownerships within the project area for the BWCAW NNIP Management Project. This cumulative effects analysis area was selected because non-federal lands within project area boundaries share a number of physical characteristics (e.g. soils, landforms, etc.) with adjacent Forest Service lands. NNIP that occur on these adjacent lands may be treated by this project. Because treatments may occur on these lands and because they are intermingled with federal lands in the project area, the BWCAW NNIP Management Project boundary makes a logical analysis unit for cumulative effects.

The time period for direct, indirect, and cumulative effects is ten years from the time project activities begin, because no effects of project activities will occur until implementation, and because most project activities should be completed within ten years.

3.8.4 Affected Environment

A wide variety of wildlife is found in the project area, and for many species, the 1.1 million acres in the project area represent high quality habitat. The many species of mammals, birds, reptiles, amphibians, and insects in the project area are representative of southern boreal ecosystems.

Habitat for wildlife in the project area can be described by landscape ecosystems. Landscape ecosystems characterize the dominant vegetation communities and patterns, and they represent the most current and best scientific information for use in analyzing forest vegetation. Landscape ecosystems are described and delineated in the Forest Plan (FP) (FP, pp.2-55 to 2-78). The amount of each landscape ecosystem found in the project area is described in Table 9.

Table 9. Landscape Ecosystems in the BWCAW NNIP Management Project

Landscape Ecosystem	Acres
Dry Mesic Jack Pine/Black Spruce	563,059
Dry Mesic Pine	48,844
Lowland Conifer	109,093
Mesic Aspen/Birch/Spruce-fir	54,626.
Mesic Pine	32,874
Rich Swamp	4,653
Sugar Maple	0

3.8.5 Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Although the effects of manual treatments to wildlife were not analyzed in the 2006 Superior National Forest Non-Native Invasive Plant Management Environmental Assessment, the proposed treatment methods under Alternative 1 are the same as for Alternative 3, and the effects would be similar. The treatments proposed by Alternative 1 would not negatively affect habitat for wildlife in the project area. The age class, vegetative composition, and within stand diversity would not change as a result of Alternative 1 for any of the landscape ecosystems in the project area. Similarly, Alternative 1 would not change age structure or composition of any management indicator habitats (MIH) in the project area. Over 80% of the treatment sites are at campsites, portages/trails, and old resort/cabin sites. None of these types of sites represent good or preferred habitat for any of the terrestrial wildlife. Over the long term, removing the NNIP at these sites would improve overall terrestrial wildlife habitat and prevent NNIP infestations from taking over larger areas of the landscape.

Direct effects to terrestrial wildlife from manual removal of NNIP are unlikely. All of the species are mobile and would most likely leave during treatments. Manual treatments of NNIP would not impact wildlife.

Alternative 2 – Proposed Action

The treatments proposed by Alternative 2 would not negatively affect habitat for wildlife in the project area. The age class, vegetative composition, and within stand diversity would not change as a result of Alternative 2 for any of the landscape ecosystems in the project area. Similarly, Alternative 2 would not change age structure or composition of any management indicator habitats (MIH) in the project area. Over 80% of the treatment sites are at campsites, portages/trails, and old resort/cabin sites. None of these types of sites represent good or preferred habitat for any of the terrestrial wildlife. Over the long term, removing the NNIP at these sites would improve overall terrestrial wildlife habitat and prevent NNIP infestations from taking over larger areas of the landscape. This benefit would be greater for Alternative 2 compared to Alternative 1 or Alternative 3.

Table 10. Summary of Effects From USDA Forest Service Ecological Risk Assessments for Proposed Herbicides

Application Rate	Terrestrial Mammals	Birds	Insects	Fish & Other Aquatic Species
Imazapic (Source: SERA 2004, p. 4-20 – 4-24)				
10 fl. oz./ac	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	No adverse effects are plausible using typical or worst case exposure scenarios at either average or maximum rates.	Very low risk of adverse effects at either average or maximum application rates
Triclopyr (Source: SERA 2011a, p. 130)				

Application Rate	Terrestrial Mammals	Birds	Insects	Fish & Other Aquatic Species
192 fl. oz/ac.	Mammals consuming contaminated vegetation are at risk of adverse effects. Large mammals are at greater risk than small mammals.	Birds consuming contaminated vegetation are at risk of adverse effects.	Triclopyr does not pose substantial risks to insects across the range of labeled application rates.	Neither terrestrial nor aquatic applications of triclopyr pose substantial risks to aquatic animals across the range of labeled application rates.
Aminopyralid (SERA 2007a, p. 102)				
5 fl. oz./ac.	There is no indication that mammals would be adversely affected by aminopyralid	There is no indication that birds would be adversely affected by aminopyralid	There is no indication that insects would be adversely affected by aminopyralid	There is no indication that aquatic animals would be adversely affected by aminopyralid
Metsulfuron methyl (Source: USDA Forest Service 2004, p. 4-23 – 4-28)				
1 oz./ac.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.	Risk of adverse effects resulting from either average or maximum application rates is unlikely.

Direct spray of RFSS terrestrial wildlife individuals is unlikely. All of the species are mobile and would most likely leave during herbicide application. However, wildlife could be exposed to herbicide through other pathways. The SERA risk assessments evaluated the potential indirect effects of herbicide use on mammals, birds, and insects, and these effects are summarized in Table 10. It is unlikely that any adverse effects would result from either average or maximum application rates of aminopyralid, imazapic, or metsulfuron methyl. The Hazard Quotient for all exposure scenarios for these three herbicides is less than 1.0 (SERA 2004, SERA 2004, SERA 2007a).

For triclopyr, the SERA risk assessment indicates that consumption of contaminated vegetation or contaminated fruit could cause a risk of adverse effects in mammals and birds; the Hazard Quotient for these scenarios is greater than 1.0 (SERA 2011a). However, for the BWCAW NNIP Management Project, this risk would be very low. For wildlife species that mainly eat meat or insects, for example species like fox, weasels, bobcat, or warblers, the risk of adverse effects is very unlikely since the species generally do not consume vegetation. None of the risk assessment scenarios for triclopyr that modeled consumption of fish, insects, or small mammals by birds or mammals indicated that these scenarios posed any risk for the target species. Therefore, it is unlikely that any wildlife species that mainly eat meat or insects would be adversely affected by Alternative 2.

For wildlife species that mainly eat seeds, fruit, twigs, or leaves (e.g. species such as grouse, mice, voles, chipmunks, red squirrels, snowshoe hares, deer, or moose) the risk of adverse effects is still low because of the types of treatments that are proposed. The types of treatments involving triclopyr would be either cut-stump treatments which would create no contaminated vegetation (none of the species would eat the cut stump) or foliar treatments of purple loosestrife. These wildlife species could consume contaminated purple loosestrife leaves or stems, but the treatments would only affect 0.3 acres scattered across 79 treatment sites. Some impacts to individuals could occur, but the quantities consumed are likely to be incidental and so small that few impacts are expected. Part of the problem with purple loosestrife and other invasives is that

nothing in the ecosystem likes to eat it, thus allowing it to thrive relatively unhindered. Once the purple loosestrife is treated with herbicide and starts to die, it would be even less likely that any wildlife species would eat it.

In general, the small risk of impacts from Alternative 2 would be balanced by the long term improvements to habitat for terrestrial wildlife. Operational standards and guidelines (FEIS Appendix B) would further reduce risk.

Alternative 3

The treatments proposed by Alternative 3 would not negatively affect habitat for wildlife in the project area. The age class, vegetative composition, and within stand diversity would not change as a result of Alternative 3 for any of the landscape ecosystems in the project area. Similarly, Alternative 3 would not change age structure or composition of any management indicator habitats (MIH) in the project area. Over 80% of the treatment sites are at campsites, portages/trails, and old resort/cabin sites. None of these types of sites represent good or preferred habitat for any of the terrestrial wildlife. Over the long term, removing the NNIP at these sites would improve overall terrestrial wildlife habitat and prevent NNIP infestations from taking over larger areas of the landscape. However, the habitat benefits of NNIP treatments would be greater for Alternative 2 than Alternative 1 or 3, since a greater amount of NNIP spread would occur as a result of Alternative 1 or 3 compared to Alternative 2 (see chapter 3.4 NNIP analysis).

Direct effects to terrestrial wildlife from manual removal of NNIP are unlikely. All of the species are mobile and would most likely leave during treatments. Manual treatments of NNIP would not impact wildlife.

Conclusion

The manual treatments proposed under Alternatives 1 or 3 would not pose any risk to wildlife. For Alternative 2, risk assessments suggest there is no plausible risk to wildlife from treatments with aminopyralid, metsulfuron methyl, or imazapic. For triclopyr, the risk assessment suggests that birds or mammals eating contaminated vegetation could be at risk for negative effects, but the triclopyr treatments sites are very small and scattered so that few actual impacts to wildlife are expected. The benefits to wildlife habitat by controlling NNIP would be greater for Alternative 2 than Alternative 1 or 3.

Cumulative Effects

There would be no direct or indirect negative effects of Alternative 1 or 3 on terrestrial wildlife, so there would be no cumulative effects of Alternative 1 or 3 on these species.

Alternative 2 would be unlikely to have any cumulative impacts to wildlife species from herbicide treatments conducted with aminopyralid, metsulfuron methyl, or imazapic since there is very low risk of direct effects from any management proposed with these herbicides. There is a low risk of cumulative effects to mammals or birds that consume vegetation contaminated with triclopyr. These species could be exposed to some herbicide treatments conducted for NNIP under the 2006 NNIP Management Project – these treatments could occur close to the BWCAW such as at entry points. There could also potentially be herbicide treatments conducted by

homeowners whose private land borders the BWCAW, such as landowners on Snowbank Lake. However, in general these treatments would be so dispersed that they represent a very minor cumulative effect. Therefore, the risk of cumulative effects to wildlife from Alternative 2 is quite low.

3.9 REQUIRED DISCLOSURES

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

3.9.1 Short Term Uses and Long Term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Containment and eradication of NNIP at scattered sites in the project area would reduce the abundance of NNIP in both the short and long term and ensure that long term productivity is not threatened by NNIP. There could be minor short term impacts to native vegetation, but these would not threaten long term productivity. There would be no discernible impacts on landtype ecosystem composition and age class distribution resulting from this project.

3.9.2 Unavoidable Adverse Effects

The effects analysis for human health, wilderness, aquatic resources, NNIP, native plants, RFSS species, threatened and endangered species, and wildlife identified only minor negative effects associated with this project. This project would have no unavoidable adverse effects.

3.9.3 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

All resources were evaluated to determine if there would be irreversible or irretrievable commitment of resources. This project would cause no irreversible or irretrievable commitment of resources.

3.9.4 Other Disclosures

Possible conflicts between the proposed action and federal, regional, state, and local land use plans, policies, and controls for the area concerned

This project has been scoped with federal, tribal, regional, State and local government and any comments or concerns have been considered in developing the proposed action and other

alternatives. There are no known conflicts with land use plans, policies and controls in the project area.

Energy requirements and conservation potential of alternatives and mitigation measures
The energy consumption from this project would likely be higher for Alternative 1 or 3 than Alternative 2, because more invasive species treatments would be required for these alternatives than Alternative 2. This would require more trips in the project area and hence more fuel consumption under Alternative 1 or 3.

Natural or depletable resource requirements and conservation potential of alternatives and mitigation measures.
This project would not cause depletion of any natural resources.

Urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of alternatives and mitigation measures
This project would not include activities in urban areas and would not affect urban quality or the design of the built environment. This project would have no effects on historical and cultural resources (see project file). Effects would be avoided through following Forest Plan direction and project operational standards and guidelines.

Federal permits that may be needed to implement the project
There are no known federal permits that may be needed to implement the project at the publication of this Final EIS. No road construction is proposed for this project. No National Pollutant Discharge Elimination System (NPDES) Permit is needed for roads. As documented in section 3.3.5, there would be no discharge of herbicides into any water body because design features and mitigation measures would be followed; therefore, this project would be covered under NPDES State Disposal System General Permit MNG87D000 (MPCA 2011). The herbicides proposed for use are all registered with the U.S. Environmental Protection Agency and permitted for use in the State of Minnesota.

Air quality
Protection measures found in FEIS Appendix B include provisions, such as adhering to herbicide label requirements and restrictions related to wind speed that would minimize dispersal into the atmosphere. Also, herbicides would be limited to ground applications well dispersed over a very small percentage of the project area. These factors result in air quality effects that would be extremely minor and well within the requirements of the Clean Air Act.

CHAPTER 4: CONSULTATION AND COORDINATION

4.1 CHANGES BETWEEN DEIS AND FEIS

Between the DEIS and the FEIS, numerous small changes were made to the DEIS document and appendices in response to comments requesting factual clarification on topics such as disposal of NNIP, monitoring native plants at treatment sites, empty herbicide container management, applicator training, monitoring, and several others. Appendix N which describes the response to comments on the DEIS was added. There were also some minor edits to clarify effects to wild rice in Section 3.3.4. There was also one minor change in the proposed action in response to a comment on herbicide discharges, which is that manual treatments would be used rather than

herbicide treatment for purple loosestrife if standing water is present at the base of the purple loosestrife at the time of treatment. There were no major changes to the effects analyses, to the approach taken for these analyses, or to any other part of the document between DEIS and FEIS.

4.2 PREPARERS AND CONTRIBUTORS

The following individuals, Federal, State, and local agencies, bands and non-Forest Service persons contributed in the development of this environmental impact statement.

4.2.1 Interdisciplinary Team Members

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MS in Forestry Recreation Management, University of Montana, 2001

Peter Taylor
SNF Environmental Coordinator
6 Years experience-Environmental Coordinator
MF/MEM Forestry and Environmental Management
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4.3 DISTRIBUTION LIST

4.3.1 Federal, State, and Local Agencies

The following federal, state and local agencies were involved in the public scoping efforts:

St. Louis Co. Land Dept.
MN DNR
Lake County Highway Department
Cook County Board of Commissioners
Lake Co. Land Dept. (MFRP)
Lake County Board of Commissioners
Quetico Provincial Park
U.S. Fish and Wildlife Service
Lake County Wetland Technical Committee
EPA
Town of Morse
Kakabeka Falls Provincial Park

4.3.2 Tribes

The following organizations representing affected bands were consulted during the public scoping:

1854 Treaty Authority
Grand Portage Band
Fond du Lac Band
Bois Forte Band

4.3.3 Others

The following organizations and individuals were involved in the initial public scoping efforts:

Organizations

Adventurous Christian, Inc
All Terrain Vehicle Assoc. of MN
Anderson Canoe Outfitters Inc.
Arleigh Jorgenson
Arrowhead ATV Club
Arrowhead Coalition for Multiple Use
Arrowhead Wilderness Outfitters, LLC
Back Country Bear Hunts
Bear Track Outfitters
Bearskin Lodge
Beaver Bay Sports
BEDA (Stony Spur)
Bert Heep/Drew Brockett
Betsy Vosburgh
Big City Mountaineers
Blandin Forestry
Blayne & Charlene Hall
Blue Ribbon Coalition
Bob & Missy LaTourell
Boundary Canoe Trekking
Boundary Waters Experience
Boundary Waters Journal
Brian Springstead
Bud Darling
Camp Birchwood for Boys
Camp Buckskin
Camp Manito-Wish YMCA
Camp Mishawaka
Camp Nebagamon
Camp Voyageur
Canadian Border Outfitters
Canadian Waters Inc.
Canoe Country Outfitters
Cascade Lodge
Chilly Dogs Sled Dog Kennel
Clearwater Canoe Outfitters
Cody Detzel
COLD SPRING INC.
Conservationists With Common Sense (CWCS)
Cook County News Herald
Cornell College
Custom Cabin Rentals
Dan & Ryan Waters
Dan McConville
Dan Sanders
Daniel & Suzanne Churchill
Debbie Schaper
Deborah & John Erdmann
Deer Cabin Partnership
Duane's Canoe Outfitters
Duluth News Tribune
Duluth Public Library
Echo Trail Outfitters
Eli Hill
Ely Echo
Ely Outdoors Co.
Fishhook Properties
Forestry Library, University of MN
Fortune Bay Resort Casino
Frank and Nicole Udovich
Friends of the Boundary Waters
FSEEE
Gary & Marcy Gotchnik
Gene & Jane Ott
Girl Scout Council of St. Croix
Girl Scouts Lakes and Pines
Girl Scouts of Minnesota and Wisconsin
Golden Eagle Lodge Inc.
Grand Slam Guide Service
Great Lakes School of Log Bldg
Gregory Garvick
Gunflint Northwoods Outfitters
Gunflint Pines Resort
Gunflint Trail Outfitters' Assn
Hedstrom Lumber Company Inc.
HUNGRY JACK LODGE
Hungry Jack Outfitters & Cabins
International Wolf Center
IZAAK WALTON LEAGUE OF AMERICA
James & Carol Hanson
James Orcutt
Jason Zabokrtsky
Jasper Creek Guide Service Inc.
Jeff Drew
Jim Crouch & Associates
Joan Howard & Jim Blauch
Joe Carlson
John & Lynn O'Kane
John & Sheryl Swenson
John B. Ridley Research Library
John Schiefelbein
John Swenson
Jordan's Wilderness Shop & Outfitters Inc.
Julie Hignell/Sue Ellen Sach
Kelly Lee Shepard
Knotted Pine Inn
LaCroix Outfitters
Lady Bug Lodge & Canoe
Larry Runningen
LaTourell's Resort & Outfitters
Lee & Sue Hotaling
Leif Gunderson
Lutsen Mountains
Maple Grove Motel and Bait Store
Mark Bland
Mary Rosenwinkle
Mike Stark's Northwoods Guide
Minnesota Forest Resources Council
Minnesota Historical Society
Minnesota Land Trust
Minnesota Power/land And Water
Minnesota Trout Unlimited
MN Center for Environmental Advocacy (MCEA)
MN Forest Ind./MN Timber Producers Assoc.
MN Forest Industries Inc
MN United Snowmobile Assoc.
Mundt & Associates
Murphy's Border Country
NCFES, University of MN
Nicole/Carl Boyles

Nor'wester Lodge
North Coast Baits
North Country Canoe Outfitters
North Country Trail Assoc
North House Folk School
North Star Christian Adventures
Northern Lakes Girl Scouts
Northern Tier High Adventure
Northwind Outdoor Recreation Inc.
Northwoods Audubon Center
Northwoods Guide Service
Norwester Lodge and Outfitters
Outward Bound Wilderness
Owens Forest Products
Packsack Canoe Trips & Log Cabins
Paul Riegert
Paul Schurke
Phantom Ranch Bible Camp
Piragis Northwoods Co.
PoplarCreek Guesthouse B&B
Potlatch Corp.
Rita Wehseler
River Point Resort
River Point Resort & Outfitting Co.
Rob Nelson
Robert & Mark Olson
Robert C. Oliva
Robert Derr
Rockwood Lodge & Outfitters
Ron & Julie Schmidt
Ron Fuhrman
Rutar Logging LLC
Ryan Olson
Saganaga/seagull Homeowners Assoc.
Sappi
Saraphine Metis
Sawbill Outfitters
Sawtooth Outfitters
Seagull Canoe Outfitters
Seagull Creek Fishing Camp
Seagull Outfitters
Sherricks Wilderness Resort Inc.
Sierra Club
Soltreks, Inc.
SPIRIT OF THE WILDERNESS
Spirit of the Wilderness
Stacy Houglum
Steve & Jane Koschak
Steven & Ginny Nelson
Stone Harbor Wilderness Supply
STORA ENSO NORTH AMERICA
Stuart McEntyre
The Canoeist
The Moose Bay Company
The Nature Conservancy
The Nature Conservancy
Thistledew Programs
Timber Trail Lodge LLC
Timothy Spencer
Todd J. Larson
Tom Pearson
Tuscarora Lodge and Outfitters
Tuscarora Outfitters
U of M Soil, Water, Climate Dept.
UM Dept of Forest Resources
United Northern Sportsmen
Vermillion Community College
Vince Ekroot
Voyageur Canoe Outfitter
Voyageur Lutheran Ministry
Voyageur North Outfitters
Way of the Wilderness
WDSE-TV
Whispering Wilderness Inc.
White Wilderness
Wilderness Canoe Base
Wilderness Inquiry
Wilderness Journey Outfitters LLC
Wilderness Outfitters
Wilderness Society
Wilderness Winds Camp
William Forsberg
William Hane
Williams & Hall Wilderness Guides
WOHVA
Wolf Ridge ELC
Woman's Time Out
YMCA Camp Menogyn
YMCA Camp Warren
YMCA Camp Widjiwagan
YMCA-St. Paul Camps
Zups Fishing Resort and Canoe Outfitters

Individuals

Joanne Alt
Alan Anderson
Bob Anderson
Frederick Anderson
Curt Anderson
Lori Andresen
Tim Bassett
Bruce Bates
Jean Bergerson
Robert Beymer
Ray Bisco
Bart Boyer
Joseph Bradel
Mickey Brazell
Martin & Heidi Breaker
Randall Breeden
James Brewer
Terry & Shirley Brown
John & Gloria Buetow
Cynthia & John Cantrell
Joseph B. Caulfield
Leonard Cersine
Michael Christensen
Thomas Christiansen
Charles Cieluch
William Corrigan
David Cosgrove
Jeff Drew
Robert Dunn
Bill Durning
Kenneth Eckstein
Kyle & Beth Edlund
Donald Emery
Stephen Erickson
Douglas Foster
L. Frenzel
John Ganey
Thomas Gardner
Don Germain
Glenn Gilyard
Stephen Good
Duane Gustafson
Charles Harri
Steve Haessly
George Harris
Curt Heikkila
Jim Heinz
David Henning
Brian Henry
Darlene Hill
Lynne Hill

Nancy Hoffman
Jim Howe
John Hughes
Scott Hull
William Ion
Rick Jannett
Jim Jensen
Douglas Johnson
Warren Johnson
Maureen Johnson
Darrel Johnson
William Karow
Karl Kendall
Robert Klestil
Bob and Georgine Koschak
Martin Kubik
Carl Kunnari
Richard Lachenmayer
Ronald Lemke
Mr. Thomas Lentz
Peter Leschak
Alan Lindberg
Steve Loch
John Lofgren
David MacLean
Robert Maki
Paul Martin
Peter McClelland
Brenda Meek-Peterson
Bruce Mellor
Greg Merritt
Ray And Connie Mickolajak
Martin & Rebecca Milanese
Mike Miller
Robert Monehan
Robert & Carolyn Morrow
J Phillip Morud
Judi Motschenbacher
Susan Mulholland
Scott Neustel
John Norton
Gerald Olsen
Dick Olson
Robert And Kay Olson
Michael O'Phelan
Brent Ostwald
Randy Palm
Ray Payne
D. Robert Peterson
Thomas Peterson
Jean Probst
Jim Raml
Charles Rasor
Joseph Roberts
Randy Roff
Ron Rude
Bradley Sagen
Craig Salo
Jerry Schliep
Lori Schmidt
Eric And Sharon Schneider
Connie Schumann
Harmon & Karla Seaver
Marilyn D. Sly
Mark Stange
James And Arlene Stirratt
Donald Stocks
Robert Stodola Jr.
Bud Stone
Jim Sulerud
Bill & Helen Swanson
Roger & Donna Thompson
John Todd
Mary & Greg Truex
Ronald Tveiten
Jim Uhrinak
Karen Updegraff
James Van Tassel
Robin Vora
Doug Wallace
Robert & Sandra Walton
Garry Ward
Jay and Ella Warmington
Thomas & Rea Wartman
Kris Wegerson
Jane Davis Weida
Thomas Wetzel
Dyke Williams
M Wisti

4.3.4 Distribution of the Draft EIS

The following individuals and organizations commented on scoping and received notifications of this Draft EIS:

Friends of the Boundary Waters Wilderness
Paul Friesema
Brian Henry
Izaak Walton League
Joe Kirkeby
Bruce Mellor
Minnesota Department of Natural Resources
Daniel H. Mundt
Dan Nelson
Northeastern Minnesotans for Wilderness
Mark Paschke
Jean Public
Harmon Seaver
Dyke Williams

In addition, the following governments and agencies received notification of the Draft EIS:

Bois Forte Band of Chippewa
Fond du Lac Band of Lake Superior Chippewa
Grand Portage Band of Lake Superior Chippewa
1854 Treat Authority
Cook County Board of Commissioners
Lake County Board of Commissioners
St. Louis County Board of Commissioners
Minnesota Pollution Control Agency
Advisory Council on Historic Preservation
Army Corps of Engineers
Federal Aviation Administration
Federal Highway Administration – Minnesota
National Agricultural Library
U.S.D.A. Animal and Plant Health Inspection Service
U.S.D.A. Natural Resources Conservation Service
U.S. Coast Guard
U.S. Department of Energy
U.S. Department of Interior
U.S. Environmental Protection Agency

Lastly, the following individuals requested notification of the Draft EIS after the scoping report was published:

Dick Artley
Ethan Smith
Wilderness Watch

4.4 GLOSSARY

Biological control – the deliberate use of naturally occurring organisms to limit the distribution and abundance of target weeds. These organisms are usually indigenous to the region where the weed itself originated.

Contain – to treat portions of the infestation to prevent spread of the weed beyond the perimeter of the infestation

Degrade: Taking an action that has an adverse impact on wilderness character. Actions that have an adverse effect on wilderness character are described as 'degrading' wilderness character in the USDA Forest Service GTR WO-80 from 2009 and USDA Forest Service RMRS-GTR-212 from 2008. An action that has an adverse effect on or degrades wilderness character does not necessarily violate Section 4b of the Wilderness Act. The type, magnitude, and context of degradation is considered by the agency for whether the action complies with Section 4b of the Wilderness Act.

Eradicate – to treat a weed infestation to the extent that no viable seed is produced over the entire infestation and all plants have been eliminated during the current field season

Forb – a non-grasslike herbaceous plant

General Use Herbicide – herbicides that are registered herbicides that do not require a license or other certification for their purchase or use

Hazard quotient (HQ) – name given to a risk factor used in Forest Service herbicide risk assessments. This is the ratio between the estimated herbicide dose projected by a risk assessment exposure scenario and the reference dose. When a scenario has a dose less than the reference dose, then the HQ is less than 1.0, and toxic effects are unlikely for that specific scenario.

Integrated Pest Management – a coordinated approach to pest management that involves considering the pest and its life cycle, the surrounding habitat and environment, and available control methods to determine the most effective means of meeting pest management goals

NOAEL – stands for No Observed Adverse Effect Level. This is a level that represents the highest level of herbicide exposure at which no adverse effects are observed.

Outstanding Resource Value Waters - a state designation for waters of Minnesota that have high water quality, wilderness characteristics, unique scientific or ecological significance, exceptional recreational value, or other special qualities that warrant stringent protection from pollution (Minnesota Rules 7050.0180)

Pesticide – Any substance or mixture of substances intended for 1) preventing, destroying, repelling, or mitigating any pest or 2) use as a plant regulator, defoliant, or desiccant. Used as a synonym for herbicide.

Reference dose (RfD)– a threshold used for estimating the risk of health effects from herbicide exposure. This reference dose is the NOAEL divided by an uncertainty factor (usually 100) to establish a conservative threshold of health effects.

Rhizomatous – a horizontal underground stem

Taproot – a root system with a main root axis and smaller branches (e.g. like a carrot)

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4.5 INDEX